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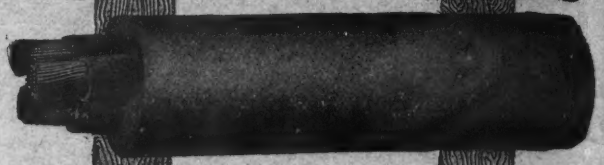

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ELECTRICAL REVIEW.

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INDUSTRIAL PROBLEMS.

PRESIDING over the Engineering Section of the British Association at Newcastle last week, Mr. Gerald Stoney delivered an address which is bound to attract attention in engineering circles, if only for the candour and fearlessness with which the author alluded to certain blemishes on the fair fame of the industry. His theme was "errors committed in the past"; some of the points with which he dealt have often been referred to in these columns, and we welcome the confirmation of our views conveyed in his remarks, which we have reproduced almost *in extenso*.

The want of appreciation of scientific methods, and scientifically trained men, amongst engineering firms—which, one would think, should be the very first to perceive their advantages—with which Mr. Stoney opens his address will soon, we hope, be a thing of the past; the importance of such aids, which under modern conditions are indispensable to success, has been recognised in many quarters and effectively driven home by the war. In this reform the great engineering institutions have played a part which reflects credit upon their Councils. The value of research, especially on a large scale under national auspices, was also fully emphasised by the author, and need not be laboured here. But perhaps the most noteworthy passages in the address are those in which Mr. Stoney discusses the relations between employers and employed, and the changed conditions which have arisen from the replacement of the individual employer by the limited liability company—a change to which many of the Labour troubles of to-day can be directly traced.

Mr. Stoney explains, in language which any workman can readily grasp, the functions of the capitalist and the impossibility of dispensing with his assistance, but focuses attention on the responsibilities which the capitalist must discharge towards the workers, the neglect of which is at the root of much of the distrust which so generally reigns between the two parties. The propagation of the gospel of "Welfare Work," and the carrying into effect of its teachings, will go some way to remedy this state of feeling and bring about more cordial relations, but we believe the crucial questions are concerned with the fixation of rates of wages, and the correlated question of the amount of work to be done. The present system of payment on time appears to us to be analogous to selling electricity by contract; the amount of payment is independent of the work done, and naturally he who sells the work tries to keep down the quantity delivered. A fairer system is to pay in accordance with the output, a system analogous to sale of energy by meter; this involves discrimination between individual capacities for work. But as in electricity supply a still better and more equitable plan is to charge a fixed sum plus so much per unit, so in the workshop the best system is that which assures to the workman a reasonable weekly wage, plus a bonus depending directly upon his output. As Mr. Stoney says, the question is a difficult one, and when we come to the adjustment of prices for piece-work, the difficulties are multiplied. Yet they must be faced, for the question is of fundamental importance. We note that Mr. Stoney corroborates the view to which we have given expression from time to time, that price-cutting on piece work is largely responsible for the restriction of output on the part of the men. As he

observes, "If the price has been fairly fixed, why should it be reduced because the man makes large wages due to his skill and industry?" The employer gets the benefit of the increased output with practically no increase in the standing charges, and "*it is much more important to get large output than to pay small wages.*" There is the case in a nut-shell. As the rule that the price must be cut if a man makes more than time-and-half imposes a penalty on the inferior workmen, who cannot maintain the same rate of output, it is obvious that the men in self-defence are simply compelled to set a limit to the production per man. The present circumstances afford a unique opportunity for putting an end to both these evil practices—price-cutting and limitation of output. We do not altogether agree with the author that it is pleasant to the workman—at any rate, the good workman—to "slack"; a capable man takes a pride in doing his best and quickest, and in this he should be encouraged by an adequate reward. The principle of a minimum standard wage plus payment in proportion to output above a minimum limit, which, as we have pointed out, is somewhat analogous to the well-known system of charging for electrical energy, has already been adopted in coal mining, and though it possesses obvious drawbacks, it is worthy of careful study. The same may be said of Mr. Stoney's further remarks on works management, which we commend to the attention of both employers and workmen—as he says, "what is really wanted is common honesty and common sense on both sides, for one side is as bad as the other at present."

Mr. Stoney's severe comments on the conduct of the large armament firms in connection with the shortage of ammunition, while not directly falling within our sphere, cannot be passed over without attention. So grave a charge, if it emanated from a less responsible source, might be regarded as the fruit of prejudice or jealousy, but coming from so well-informed and so sincere a critic, it calls for an answer from the firms concerned—and especially from certain newspapers which threw the blame of the shortage upon the late Lord Kitchener. On the remaining subjects of the address—combination of employers, standardisation of specifications, the necessity of research work, and the deficiencies of our educational system—few engineers will be found to differ from the author, whose outspoken and instructive address deserves the most careful consideration.

The Decimal System.

A NOTEWORTHY feature of the sittings of the Economic Science Section of the British Association last week was the inclusion of a paper advocating the adoption by this country of the decimal system of coinage, weights, and measures. Not the least significant fact attending this innovation—for we believe the subject has not been touched upon by the B.A. for many years—was the identity of the author of the paper, Sir Richard Burbidge, who, as the managing director of one of our most successful "stores," has attained a position of the highest standing in commercial circles, whilst the reader of the paper, in the absence of the author, was Dr. Hunter, of the well-known Tyneside firm of Swan, Hunter & Wigham Richardson, Ltd., who in the main agreed with Sir Richard's conclusions. Moreover, Mr. Gerald Stoney, President of the Engineering Section, strongly supported the proposal, and Sir Henry Cunningham, the well-known economist, also advocated the adoption of the decimal system by ourselves, in conjunction with the rest of the English-speaking world. Mr. Goriol, an Australian delegate, stated that Australia and New Zealand were only waiting for the Mother Country to move, and Prof. A. W. Kirkaldy, President of the Section, also urged that the Anglo-Saxon world should act together in bringing about this much-needed reform.

For some time past the daily Press has shown a modest degree of interest in the subject, and leader writers have urged that the time had come to deal with the question resolutely. Hitherto the flabby wait-for-a-mandate attitude of our Government has been the greatest obstacle to progress, and we cordially welcome the accession of the lay Press to the ranks of the agitators, as an indication that public opinion is being aroused. We have done all that we could to stimulate interest in the subject—our readers hardly need be reminded that in October and November last year, in a series of articles extending over seven weeks, we endeavoured to explain the necessity of the change, and to dispel some of the illusory ideas which prevail with regard to the difficulties in the way of its accomplishment. Since then progress has been made—slow, it is true, but not less sure for that; the Council of the Institution of Electrical Engineers has definitely declared in its favour, and other public bodies have expressed their approval, while Press references to the subject grow continually more frequent. We cordially welcome a leading article in the *Daily Telegraph* of Monday last, on "Necessary Reforms," which concludes with this admirable summary:—

> Germany and Austria-Hungary recognised many years ago the virtues of the decimal system. Their policy of uniformity conferred no slight benefit upon them in their relations with foreign markets. When peace comes it is imperative that this advantage should not any longer be theirs to our injury. This is essentially a matter for the trading communities. Their interests are menaced by adherence to a currency and system of weights and measures which hinder trading. We are inclined to the belief that, as in other reforms, the necessary changes would prove far less disturbing than is sometimes anticipated, since the movement would be from chaos to order. Once the reforms were carried out, our only wonder would be that we had so long been blind to their advantages.

The Metropolitan Electric Supply Co.

IN our issue of March 31st we drew attention to the proceedings at the annual meeting of the Metropolitan Electric Supply Co., and commented at some length upon the satisfactory progress of the company on the one hand, and the extraordinary attitude of the chairman, Mr. W. H. Cripps, and his colleague, Mr. F. L. Harris, towards the development of the power load at low prices on the other. Elsewhere in this issue will be found the report of the committee of shareholders that was appointed at the annual meeting to investigate the company's affairs and to consider questions of past and future policy, from which it will be found that the committee has implicitly endorsed every word of our criticism, that Mr. Cripps has resigned the office of chairman, and that the value of Mr. Highfield's services to the company has been cordially recognised, while his policy of development has been strongly recommended to the shareholders.

No other conclusion could have been attained by any body of business men who were acquainted with the circumstances and conditions appertaining to the supply of electricity on commercial lines, and the tendencies of engineering practice at this time, which clearly point to the continued adoption of electricity for motive power and allied purposes at an increasing rate. The committee had the assistance of experts of the highest standing in engineering and finance, whose reports were doubtless of very great interest; it is to be regretted that these are not to be published, though of course we have no fault to find with the decision of the committee in a matter so intimately affecting the company's interests.

The new board of directors, strengthened by the addition of men in the front rank of the electrical industries, and provided with full information as to the position and prospects of the company, will have

a first-class opportunity of guiding its affairs on sound lines towards the goal of prosperity, and it only remains for the shareholders, at the meeting which has been called, to express their approval of the arrangement which has been made on their behalf by the committee, and to authorise the directors to "carry on" in accordance with its recommendations; we trust that this course will be followed, and that under enlightened control, and the able management of Mr. Highfield, who has done so much already to improve the company's position, the future of this great undertaking will present a record of unbroken progress and success.

Pig Lead.

There has not been a great deal of activity in pig lead in the last few weeks, nor has this been possible, for the simple reason that the market has been unusually bare of sellers. It is rather difficult to understand that buyers were, until towards the end of August, constantly bidding up prices against each other, seeing that parcels were systematically withheld in the absence of offers from the authorities, who have the market entirely under their control. Certain dealers were apparently short, and, therefore, rather fidgety, and prices eventually rose to about £31 10s. for immediate delivery, although no business was done over £31 for near shipment.

In the course of this month there has been a distinct change of attitude on the part of consumers since the reappearance of offers from controlled sources, which has been anxiously awaited. Fair quantities have been already released in that direction, and probably more lead will come on the market, while the arrivals have been on a more liberal scale. That the authorities are now in a better position to afford relief may be attributed to the fact that the heavy extra requirements for Russia have been met. The market has already yielded considerably, prices for near positions now being in the neighbourhood of £30, though there is still a fair demand going on, which, however, is chiefly confined to near arrivals. Forward positions have not attracted quite so much attention, though there is no pressure to sell. The position was a few weeks ago complicated by the fact that some desilverisers were caught somewhat short against outstanding contracts entered into with smaller European producers, whose operations were suspended through lack of fuel. American metal is free from Government control, but no American or Mexican metal is being shipped to this side. America, of course, has been competing in other directions, very considerable quantities having been sold and shipped by that country to Russia *via* Archangel.

There is apparently not much surplus available for export on the other side at present, inasmuch as a good tonnage was also diverted to Canada. Domestic consumers were short, and bought freely lately, which, coupled with a scarcity of prompt stuffs, accounts for the firmness of the trans-Atlantic market. Our total imports, as officially returned for August, were only 14,960 tons, making an aggregate of 108,804 tons for the eight months, this showing a deficit of 78,000 tons against the same period last year, but these figures are very misleading, for they do not include the lead that has come in on Government account. Similarly, it is probable that the considerable quantities of Government metal diverted to Russia are not included in the re-export returns, so that the statistical position cannot be gauged. Yet, there is good reason for believing that the total supplies that have reached this country so far this year are not anything like so large as in the previous year, when the United States contributions were abnormally heavy.

The French imports have been maintained on a heavy scale, chiefly from Spain, the total for the first half of this year being roughly 42,500 tons, or some 17,000 tons in excess of the previous year, this being, of course, explained by France's huge munition requirements. The Spanish exports for the same period were, too, very big, an indication that production has not suffered very severely from the scarcity of fuel. Consumers of red and white lead continue to find great difficulty in obtaining supplies owing to an acute scarcity, partly attributed to labour shortcomings.

The Wire-Drawing Industries.

The need for a closer co-operation of interests among the leading British wire manufacturers, as regards the retention of trade previously done in these markets, and the acquisition of new business which has been allowed to go elsewhere, has been fairly well exemplified in one or two instances during the past twelve months. The shutting-out of German wire manufactures, which, in the copper section, shared far too large a proportion of the home trade in this country, and the continued difficulties experienced in obtaining shipments from America, have presented favourable opportunities for the creation of new wire manufacturing businesses on a small scale, which, in some cases, have been backed up, guaranteed, and partly financed by leading houses in the electrical trades, as a result of the continued failure to obtain sufficient supplies elsewhere.

In one or two cases the entire output of small firms drawing the finer sizes has been, we understand, bought up by one or more important electrical houses, in order to guarantee the latter a continued supply of copper wire. The demands made upon these comparatively new firms have, in some cases, exceeded their output capacity by two or three times, whereas complaints have been heard from one or two of the largest wire manufacturers in this country of a distinct tendency to slackness in the fine-wire department.

There are, doubtless, other causes responsible for this position, but the success of the small firms has been attributed, to a large extent, to the fact that they have laid themselves out systematically to inquire for new business previously done by the German firms and others, with the satisfactory results mentioned.

The Supply Monopoly Question in Germany.

The German and Prussian Municipal Council has at last felt constrained to assume an attitude of opposition towards any scheme of Government domination of the supply of electricity, such as has been suggested during the course of the past two or three years. It is pointed out that the efforts of various Federal States and of Government authorities in Prussian provinces are being directed so as to secure the control of the entire system of supply. Under these circumstances the Council, representing the municipal and communal authorities, considers that these must come forward in defence of an important component part of their local government and financial interests in electricity supply works. It is held that the aims of the States, if accomplished, would lead to an artificial over-straining of the idea of centralisation, would be technically objectionable on the ground of accidental or malevolent interruption in the supply from a few large works, and would cause financial disaster to numerous existing works which are in a prosperous condition. It is further contended that a State monopoly would be prejudicial to the interests of consumers, as it would abolish the present advantage of dealing directly with individual consumers, and that the sale prices, instead of being lower, would probably be higher under a system of State domination.

THE FULLER ELECTRICAL MANUFACTURING WORKS, CHADWELL HEATH.

The firm of John C. Fuller & Son has been in existence for about half a century, the first bank pass-book of their present bankers, the National Bank of Scotland, dating back to 1865. Mr. John Crisp Fuller, the senior partner, who died in 1911 at the age of over 90, was contemporary with many of the early eminent electricians. He was associated with the Electric and International Telegraph Co., the forerunner of the present Post Office telegraphs, in its earliest days, and was thus a fellow-worker in electrical matters with Mr. Latimer Clark, Mr. Edwin Clark, Mr. Varley, Mr. Culley, Sir William Preece, and many other well-known men.

His energy and capability brought him into contact with many scientific men, amongst them Michael Faraday, whom he had the privilege of assisting in some of his experiments; he often spoke of the simple, unaffected modesty of that great man.

He was of an inventive turn of mind, and, commencing his career as he did, in the early days of practical electric telegraphy, he was able to plan and invent many things which were very useful, though they have now ceased to be identified with his name. His first patent for batteries was taken out in 1853, and this branch of electrical work has remained a speciality of the firm up to the present time. He had the management for some years, in its early days (about 1858), of the India-Rubber, Gutta-Percha and Telegraph Works Co., at Silvertown, first known as Messrs. S. W. Silver & Co. At that time, when the system of electric telegraphy was so new, there were very few sources of supply of telegraphic apparatus or material; hence it fell very largely to him to design and manufacture apparatus, insulated wire, cable, &c., and he took part in the installation of their submarine cables. He afterwards joined Mr. W. T. Henley, and was connected with the North Woolwich works for some years.

Later, he and his son, Mr. George Fuller, who is now the senior partner, joined in forming the present firm of John C. Fuller & Son. At Mr. Fuller's death, the business was, for family reasons, made into a private limited company. There are few English-speaking electrical engineers who are not familiar with the name of Fuller—Fuller's insulators, Fuller's bichromate batteries, Fuller's dry cells, Fuller's block accumulators, and Fuller's wire have penetrated nearly all over the world.

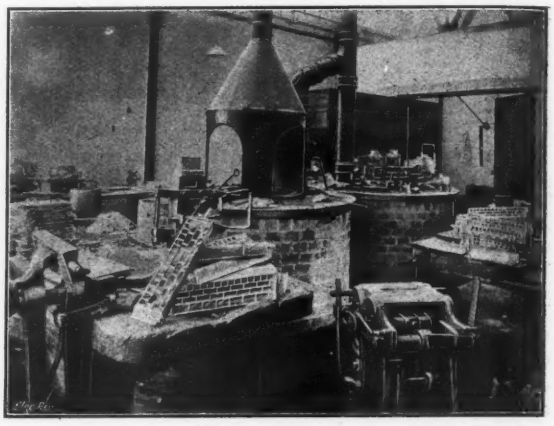


Fig. 3.—Lead Casting Shop.

Fig. 1.—Exterior of Works.

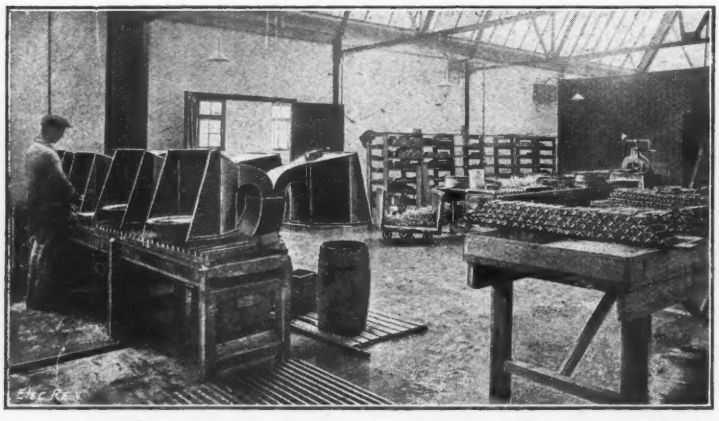


Fig. 2.—Pasting Shop.

Owing to the development of the business, their old factory at Bow has become too small, and they are now installed on about 12 acres of land at Chadwell Heath. There the firm have built an up-to-date factory and offices, the former comprising the Fuller Battery and Telegraph Works, the Fuller Accumulator Works, the Fuller Wire and Cable Works, and (in course of erection) the Fuller Carbon and Electrical Works.

The Fuller Accumulator Co., Ltd., was formed four years ago to develop the manufacture on broader commercial lines of the "Block" and plate accumulators, which was formerly a department of the parent company, J. C. Fuller and Son. The new company has been very successful, and the accumulators manufactured in its works are very widely used.

The "Block" cell, which has been described in our columns, is specially adapted to replace primary cells, particularly in connection with Post Office and railway telegraphs, and all other signalling installations in which a small current is required, as it retains its charge (when

lightly drawn upon) for two years or more, and, under ordinary conditions, requires charging only twice a year. Large numbers have already been installed by Government departments and railways, both at home and abroad, in substitution for primary cells, over which they show a great saving in maintenance and depreciation.

Messrs. Fuller's were one of the first firms to realise the possibilities of the accumulator for service in connection with motor-cars, and their batteries are well known to motorists everywhere. Quite recently the advent of the American car has brought a further development in the shape of the "Sparta" battery for starting and lighting. This battery, which was described in our issue of August 11th, is now effectively replacing the American accumulator on cars running in this country and in the Colonies. Messrs. Fuller's have branches and agencies in all the Dominions and Colonies, and on the Continent, and are continually extending their activities in fresh markets.

We give herewith some views in their new accumulator shops, which to guard against injury to the health of the workmen. Fig. 3 shows the casting shop, where the lead grids for "Block" and plate cells are cast. In fig. 2, the pasting

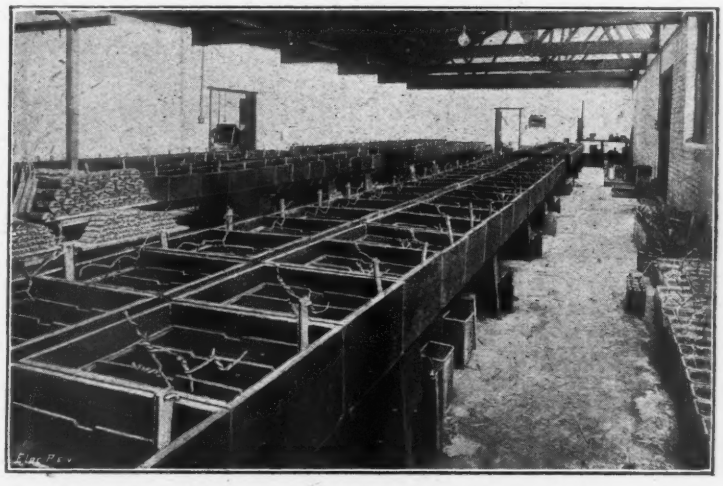


Fig. 4.—Forming Shop.

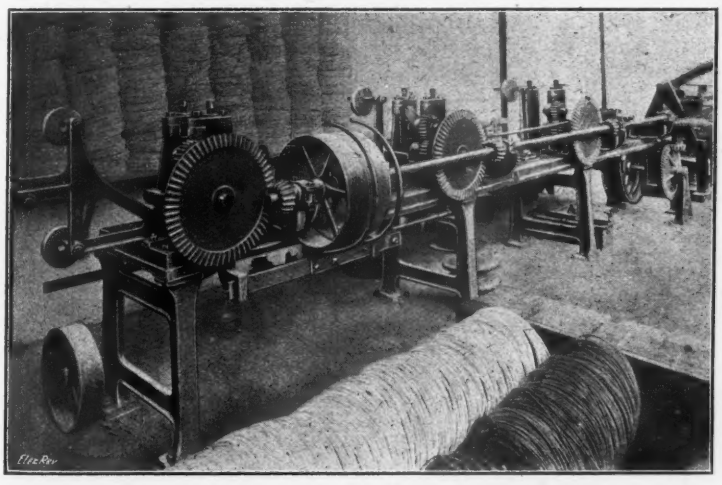


Fig. 5.—Rubber Covering Machine.

shop, the iron hoods which almost surround the bowls of paste, and are connected to air trunks which lead to an exhaust fan, are prominent features; the grids are pasted by hand, pressed in machines, and dried on racks, before passing to the forming shop, shown in fig. 4. This long room is noticeably free from the discomfort sometimes attending the liberation of gas and acid spray from so large a number of forming benches. The acid can be run off from each compartment into large vats, whence it is pumped up into elevated tanks, and gravitates to the benches without handling.

The Fuller's Wire and Cable Co., Ltd., was formed comparatively recently to develop the wire and cable business of the parent company, and is now established in a separate factory, which is fitted up on the most modern lines and equipped with the latest machinery, from the earliest stages of washing, mixing, and calendering india-rubber

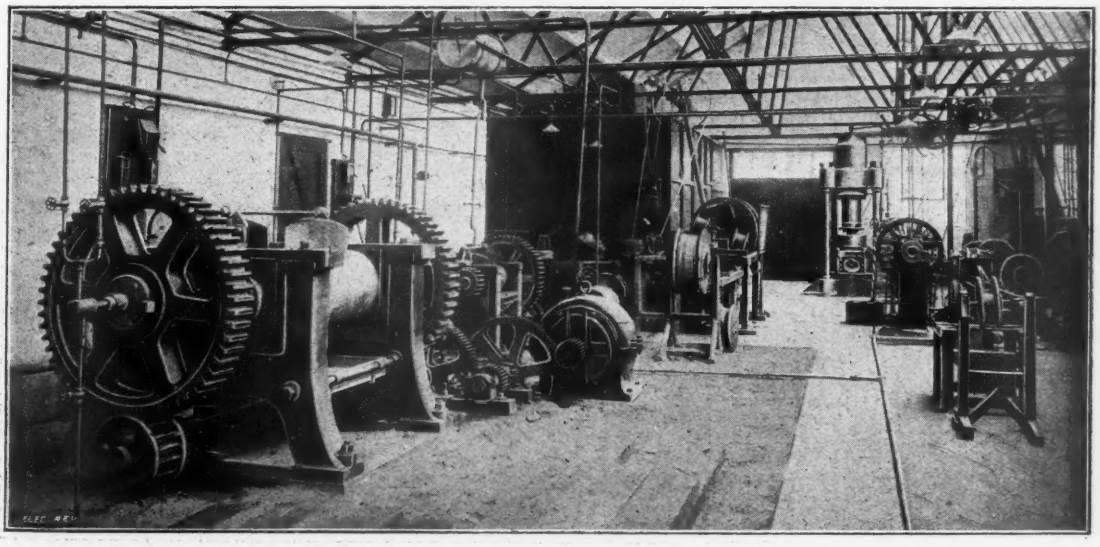


Fig. 6.—Rubber Machines and Lead Press.

are exceptionally well lighted and ventilated, and provided with the most up-to-date sanitary precautions to the final braiding or lead covering. Every description of electric-light wire and cable is being manufactured

here, and the new factory is already working at full pressure on orders which are coming in from all parts of the world.

In fig. 5 we illustrate a new machine for covering wires with rubber on the longitudinal lapping system, for the highest class of insulation; fig. 6 shows rubber grinding, washing, and mixing machines on the left, a new lead press in the background, and on the right two machines for covering wires with rubber by extrusion—a comparatively new process, but well adapted to the production of thick coatings of rubber, such as are used for motor-car wiring, and for the second grade of insulated flexible. Each machine can turn out four miles of flexible (single) a day. There is a great demand in this department, both at home and abroad, owing to the elimination of German goods from the market. Machines for brass-armouring motor-car wires, laying-up flexible cords, insulating bell wires, &c., are installed in other shops, and we give in fig. 7 a view of the braiding machinery, which includes a proportion of the latest pattern of high-speed braiders.

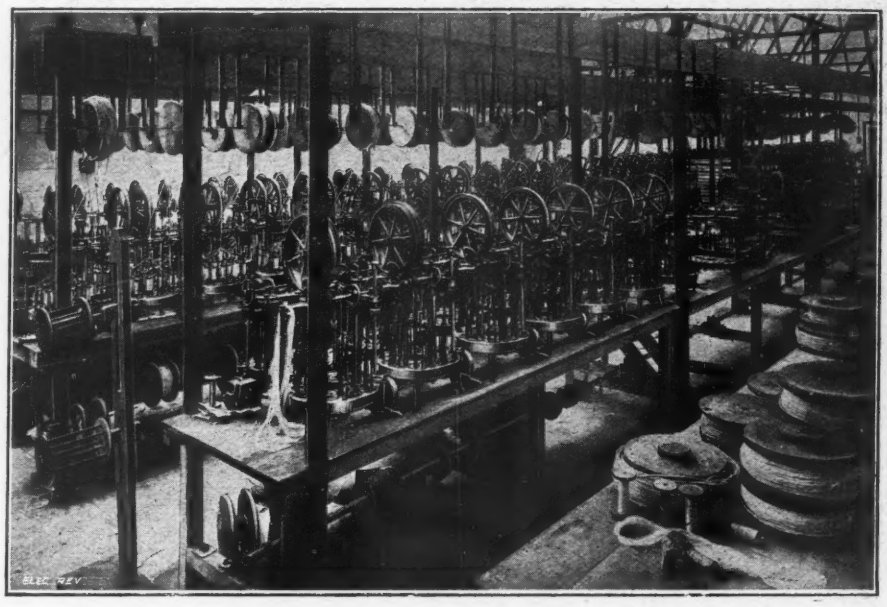


Fig. 7.—Braiding Machines.

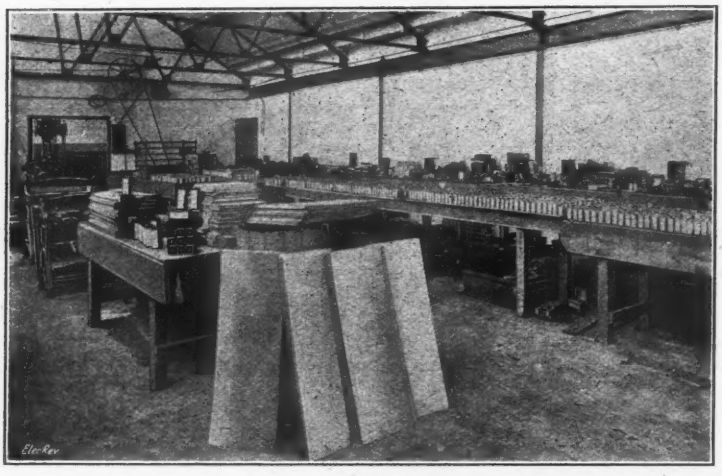


Fig. 8.—Zinc Shop.

Figs 8 and 9 are views in the primary battery shops of Messrs. John C. Fuller and Son, Ltd., the former showing the zinc shop, where the outer cases are made up, and the latter the assembling shop, where ordinary types of dry cells and the "Inert" pattern (which can be kept in stock indefinitely, only becoming active when water is poured into it) are manufactured. The firm make their own carbons for these batteries, and carry out every process in their manufacture on the premises, where they also have a well-equipped chemical laboratory. Fig. 10 shows one of the machine shops, where tools, dies, &c., are made; carpenters' shops are also provided. In another department Mansbridge condensers for telephone work are manufactured.

Fuller's Carbon and Electrical Co., Ltd., is also a development of a department of the parent company. It is well known that most of the carbons used in this country before the war came from Germany, and on the outbreak of war, manufacturers of batteries, users of arc lamps, and public bodies generally were confronted with the problem of obtaining adequate supplies. There were very few home manufacturers to draw upon, and Messrs. J. C. Fuller and Son, Ltd., decided to make the carbons which they required for their battery contracts on their own premises. A complete plant was established, and as a development from this a new factory is now in course of erection, where the highest class of battery carbons, arc lamp carbons, flame carbons, &c., will shortly be made. The company are already producing high-grade battery carbons, flash-lamp carbons, and agglomerate block electrodes. Although they have found it advisable to form separate organisations to deal with the

Fig. 9.—Primary Battery Shop.

rapidly-growing business in the products above mentioned, the parent company have also, in order to cope with the increasing demand for primary batteries, condensers, and telephone equipment and electrical apparatus, erected a new works, which is now fully occupied in turning out

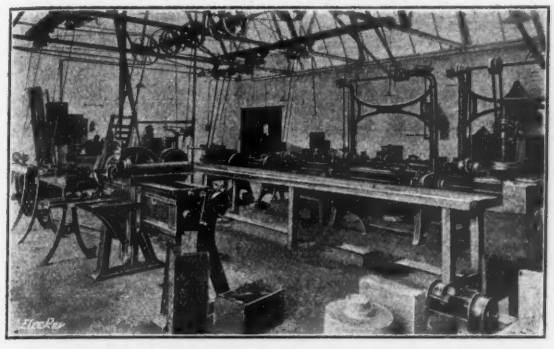


FIG. 10.—MACHINE SHOP.

enormous quantities of dry cells and other primary batteries and telephone equipment.

The factories are substantially built, well lighted and ventilated, and provision has been made for extension in the near future. The power is electric throughout. A motor garage has been provided, and we are pleased to add that an electric vehicle, propelled by Fuller accumulators, is included in the equipment.

NATIONAL INSURANCE ACT, 1911.
Extension of Unemployment Insurance.

By JOS. J. H. STANSFIELD, F.C.I.S.

THE following Order was on September 1st issued by the Board of Trade:—

UNEMPLOYMENT INSURANCE.

By the National Insurance (Part II) (Munition Workers) Act, 1916, which comes into force on September 4th, 1916, the compulsory scheme of unemployment insurance is extended to certain scheduled trades and to all workpeople engaged in munitions work. Under power conferred by the Act, the Board of Trade have now, by Order, *excluded* the following classes of munitions work from insurance:—

1. The classes of work defined in paragraphs (*b*) (*c*) (*d*) and (*e*) of Section 9 of the Munitions of War Act, 1916.
2. The manufacture of food, drink, and tobacco.
3. The manufacture or repair of garments to individual order.
4. The manufacture of constructional glass.
5. The manufacture or repair of materials wholly or partly manufactured from wool.
6. The weaving of cotton articles and subsequent processes allied thereto.

It should be noted that if any class of work is insurable otherwise than as munitions work, the Order does not have the effect of excluding it from insurance.

Although the purpose of the National Insurance (Part II) (Munitions Workers) Act, 1916, is mainly to extend the unemployment insurance provisions of the National Insurance Act, 1911, to those who are engaged in munitions work in the generally accepted meaning of the term, it will to a certain extent also affect electricity, gas, water, and tramway undertakings.

Section 1 (1) of the new Act extends the provisions of the Act of 1911 to a workman within the meaning of that Act who (*a*) is engaged on or in connection with munitions work as defined by the Munitions of War Acts, 1915 and 1916, except such classes of such work as the Board of Trade may by Order exclude, or (*b*) is employed in a trade mentioned in the first schedule to the new Act, and also to his employer as if the work on which he is engaged or such trade were an insured trade within the meaning of the Act passed in 1911.

In Section 9 (*d*) of the Munitions of War Amendment Act, 1916, munitions work was defined as—

The supply of light, heat, water, or power, or the supply of tramways facilities in cases where the Minister of Munitions certifies that such supply is of importance for the purpose of carrying on munitions work and the erection of buildings, machinery, and plant required for such supply.

A number of electricity and tramway undertakings have been certified by the Ministry of Munitions, but the Order excludes certified undertakings as such from the provisions of the new Act.

It will be noted, however, that the new Act extends to certain trades mentioned in the first schedule, and under this schedule unemployment insurance will now have to be paid by and in respect of workmen who were formerly exempt. It may here be pointed out (particularly in view of the conditions brought about by the war) that "workman" includes female as well as male labour.

The list of trades mentioned in the first schedule is as follows:—

1. The manufacture of ammunition, fireworks, and explosives.
2. The manufacture of chemicals, including oils, lubricants, soap, candles, paints, colours, and varnish.
3. The manufacture of metals and the manufacture or repair of metal goods.
4. The manufacture of rubber and goods made therefrom.
5. The manufacture of leather and leather goods.
6. The manufacture of bricks, cement, and artificial stone and other artificial building materials.
7. Saw millings, including machine woodwork, and the manufacture of wooden cases.

The insured trades mentioned in the Act passed in 1911, which principally affected electricity and tramway undertakings, were: (1) Building (construction, alteration, repair, decoration, and demolition of buildings, including the manufacture of wood fittings, commonly made in builders' workshops or yards), (2) construction of works, and (4) mechanical engineering.

Electricity and tramway undertakings are mainly affected by the new Act in consequence of the list of insured trades now including those engaged in (1) the manufacture of metals and the manufacture or repair of metal goods, and (2) the manufacture of rubber and goods made therefrom.

To some extent the decisions of the Umpire which have been published from time to time will be altered. The principal decisions of the Umpire affecting the electrical and tramway industries will be found in articles of the writer published in this journal in the issues of August 16th and October 4th, 1912, and January 10th, 1913.

Contributions will apparently now be payable in respect of the following operations which were formerly exempt:—

MECHANICAL ENGINEERING.

1. Manufacture of flexible metallic tubing in cold rolling process or cold galvanising under electric process, in joining up lengths of india-rubber and picking out foreign matter from asbestos thread, and in corrugating ribbon metal and forming it into metallic tubing.
2. Rolling, drawing, annealing, and pickling seamless steel tubes.
3. Manufacture of tubes from strips and solids, and wholly or mainly engaged in grinding.
4. Making steel welded barrels, drums, and tanks not forming part of the structure of buildings, vehicles, machinery or works.
5. Making picks, hammers, shovels, &c.
6. Workmen engaged in making metal patterns (other than cast-iron patterns) not being for the use of iron, steel, brass or other foundries, who are engaged wholly or mainly in making castings for use as parts of the products of a mechanical engineering establishment.

ELECTRICAL ENGINEERING.

1. Casting and finishing electric light fittings in brass or other copper alloy in connection with buildings, ships, and vehicles.
2. Joinery, sawmilling, and wood-turning in connection with electric light fittings and accessories.
3. Metal enamellers and lacquerers of brass or other metals in connection with electric light fittings.
4. Dismantling electric meters.
5. Manufacture of telephone and telegraphic instruments and apparatus.

6. Preparation and repair of removable electric stoves.
7. Making and assembling electric meters and arc lamps.
8. Armature and coil winding, including the assembling and insulation of commutators and collectors.
9. Telephone wiring and repairs.
10. Making parts and assembling magnetos and repairing same; making switches and cut-outs for motors.
11. Making scientific instruments.
12. Making movable electrical cooking and heating apparatus.
13. Making lead accumulator boxes or lead linings for such boxes.

Cables, Overhead Lines, and Street Lighting.

1. Manufacture of electric cables.
2. Repairing overhead, third-rail, conduit, surface contact, or cable equipments of railroads, tramways, light railways or electric power supply, the cost of which is usually chargeable to revenue account.
3. Making lamp irons and bolts for erection of lamp pillars.
4. Repairing electric controllers for lighting and extinguishing lamps.
5. Jointing cables for repairing or taking branches from mains in consumers' premises.

Generation and Supply of Electrical Energy.

1. Repairing railway sidings.
2. Repairing electric meters.

Tramways.

1. Repairing tramway lines and repairing a working tramway line.

This list is not exhaustive, but is given to show the general effect of the new Act.

The application of the Schedule will depend on the meanings of the words "workman" and "manual labour."

A workman is defined as "any person of the age of 16 or upwards employed wholly or mainly by way of manual labour," but does not include (1) persons under 16, (2) indentured apprentices, and (3) foremen or gangers who are not wholly or mainly employed by way of manual labour.

It will presumably exclude those workmen who are not wholly or mainly engaged in the trades now to be insured. For instance, a linesman who is principally engaged in patrolling and inspecting overhead lines and equipment would not be insurable, but if he were wholly or mainly engaged in repairing the lines, insurance would apparently be payable.

Arising out of the war, the Act has been passed without much attention having been paid to it, but the provisions are such that those engaged in the electrical and tramway industries will again find it necessary to go through their wages sheets to note its effect.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Crompton Half-watt Lanterns.

To meet the demand for lanterns for use with single high candle-power lamps, Messrs. Crompton & Co., Ltd., of Chelmsford, have introduced a series of special designs. Various patterns can be

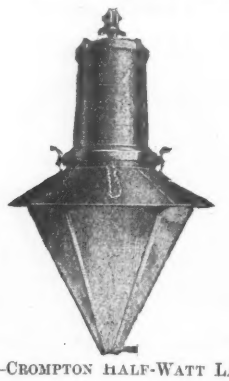


Fig. 1.—Crompton Half-Watt Lantern.

supplied, but for industrial installations the type shown in fig. 1 is generally recommended. This is a modified form of the well-tried design adopted with the Crompton-Blondel arc lamp; all the light is thrown downwards, and the renewal cost of glass is small. Clear, fluted, or muranese glass can be used, and reduces the high intrinsic brilliancy without serious absorption, as in the case of opalescent glass. Standard Goliath screw lampholders and anti-vibratory brackets are fitted, provision being usually made to take 1-in. diameter screwed conduit for suspension.

Where full lighting is not always required, a second small C.P.-holder can be provided below the larger one.

The fitting, illustrated, will take lamps up to 1,500 watts, while the other fittings are designed for up to 1,000-watt lamps.

Totally Enclosed Brake Solenoids.

Mr. George Ellison, of Victoria Works, Warstone Lane, Birmingham, recently issued a list of totally enclosed brake solenoids, which embodies novel and interesting features. These solenoids are suitable for operating the mechanical brakes on cranes and winches, and are of massive construction, as shown in fig. 2; they are provided with adjustable dash-pot action, to apply the brake gradually and release it freely. The frame consists of heavy iron castings, bolted together to form an outer yoke, which encloses the coil; a box-shaped casting bolted to one side of the frame encloses the terminals. The plunger is of polished steel, and acts both as the moving core of the solenoid and as a piston to give an adequate dash-pot effect. The coils are very carefully insulated in such a way

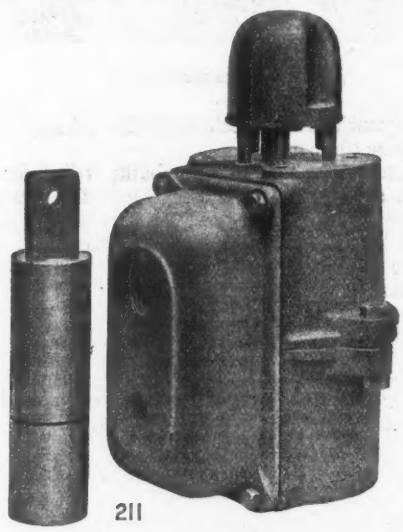


Fig. 2.—Double-Wound Magnet and Switch.

as to prevent any possibility of breakdown due to pressure rises on the interruption of the circuit, and severe tests have been applied to prove their immunity from injury due to damp and overload. A small automatic valve, which can be adjusted, regulates the dash-pot effect in applying the brake, and affords free movement when releasing it. In the firm's list No. 327 the characteristics of series and shunt windings, temperature rise, ratings, &c., are very fully discussed, and "cycle curves" showing precisely the ratios of time "on" and "off" to maintain various temperature rises for each magnet are given, as well as full details of stroke and maximum weight lifted, &c., the whole constituting an admirable technical treatise in small compass on this little-known subject. Not least important is a set of typical specifications for series and shunt magnets, to guide the purchaser in stating precisely his require ments, so that the makers will be in a position to satisfy them.

Electrical "Outboard" Boat Motor.

The Jewel Electric Co., of 112, North Fifth Avenue, Chicago, U.S.A., has placed on the market a neat little electrical outboard motor equipment for boat propulsion. The arrangement of the motor and propeller is similar to that of the usual petrol motor equipment, clamped on outside the stern of the boat. The propeller is driven by gearing from the lower end of the shaft, while the motor is mounted on the upper end, and above it is the tiller, by means of which the propeller can be swivelled round the shaft for steering or reversing the direction of the boat. The motor weighs 50 lb., and runs at a speed of some 3,000 R.P.M., the propeller being coupled through speed-reducing gear.

Two 6-volt, 120-ampere batteries are supplied with the equipment, but the firm have a range of suitable 6-12-volt accumulators of 60 to 120 ampere-hours' output.

The charging of small accumulators is not a matter of great difficulty at the present day, and the electrical outboard equipment has great advantages in the matter of cleanliness and noiselessness and freedom from vibration over the usual petrol motor equipment.

Men Wanted for the R.E.—Men with a knowledge of internal-combustion engines or any branch of electrical engineering are urgently required for the Corps of Royal Engineers, Territorial Force, aged 41 to 47. Personal application should be made to the Chief Recruiting Staff Officer, Great Scotland Yard, Whitehall, S.W., where all further particulars can be obtained.

SWISS RAILWAY ELECTRIFICATION.

The St. Gothard Line.

During the early part of the present year, the Board of General Managers of the Swiss Federal Railways reported to the Board of Directors on the choice of system to be adopted for the St. Gothard line, this matter being referred to in our "Railway Notes" on February 18th last.

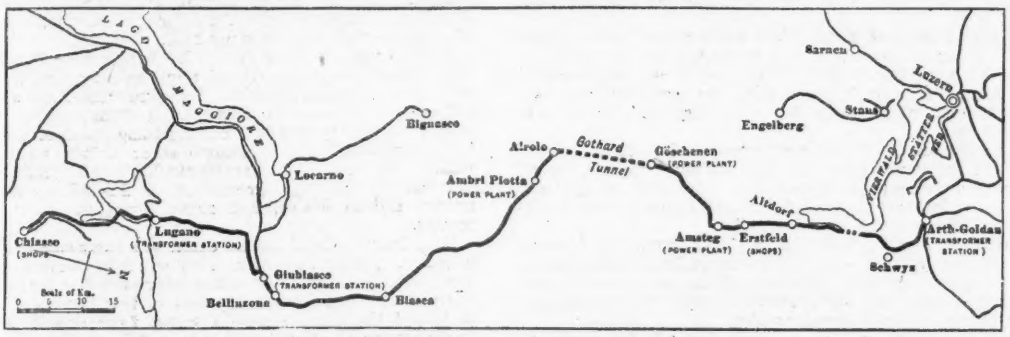
Previous reports had favoured the single-phase system, and they were finally confirmed, after considering the progress made in direct current and three-phase railway work. According to the *Electric Railway Journal*, it was not considered possible to obtain sufficient information at an early date regarding the use of direct-current for heavy traction.

The three-phase system was not considered applicable on account of the impossibility of securing satisfactory speed control, and of the necessity for using two contact conductors.

The results obtained with single-phase working on the Loetschberg line, according to the report, are such that this system can be recommended without reserve. This opinion is confirmed by the developments on the New York, New Haven, Westchester and Boston, Boston and Maine, Pennsylvania, and Norfolk and Western electrifications in North America. These developments have furnished the solution of all technical problems which have presented themselves on the federal railway system. The adaptability and elasticity of the single-phase current have been well demonstrated, and it has been applied for a considerable time and on a large scale successfully. In addition, nearly all of the manufacturers have participated in the single-phase development.

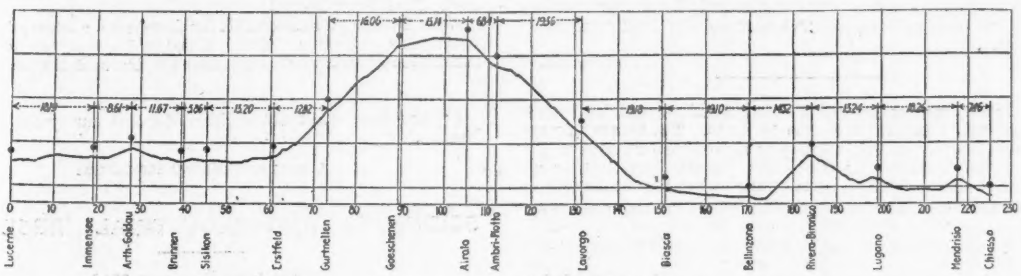
In order to show that the difficulties encountered in single-phase development had not been overlooked, the managers give a number of examples of difficulties encountered in several installations, namely, on the Loetschberg line, the New York, New Haven, and Hartford Railroad, the Midi Railway in France, and the Wiesenthal line in the Grand Duchy of Baden. In the case of the Loetschberg Railway, one of the difficult problems was the design of the locomotives. Even the New Haven Railroad had, until within a few years ago, a struggle with various technical difficulties. The experience thus gained no doubt influenced the Pennsylvania Railroad to adopt single-phase on the Philadelphia electrification in spite of the good results obtained on three lines of the first importance with low-tension direct current with the third-rail system. In spite of difficulties on the Midi Railway with inductive interference, there is no thought of changing the system. The mechanical difficulties on the Wiesenthal line in connection with the locomotive have long since been overcome. The results obtained by the Swedish State Railway on the Kiruna-Riksgraensen line cannot yet be considered definite, on account of the interference with its traffic by the present war, but the experience has been sufficiently satisfactory to warrant the equipment of a much longer line between Kiruna and Lulea.

The report reviews the progress which has been made in increasing the voltage on direct-current lines. The managers had followed with great interest the Butte, Anaconda and Pacific Railway electrification, and the Canadian Northern Railway electrification at 2,400 volts. The former was only of general interest, because the capacity of the single locomotive was small and the speed low. The Lancashire and Yorkshire electrification was also mentioned, attention being called to the fact that after experimenting with a 3,500-volt line, a 1,200-volt third-rail system was adopted on a later section of the same system. The Michigan Railway installation at 2,400 volts was also mentioned. In referring to experiments on the last-named railway with voltages higher than 3,000, the managers state that these did not appear to be of great interest. They point out that in their previous report they called attention to the necessity of using at least 3,000 volts with direct current, as applied to heavy trains moving at high velocity. They state that the partisans of the direct-current system, in citing the great increase in the length of line electrified with high-tension direct current, or on the point of being electrified, have principally in mind cases where light trains are used, or where the voltage is less than 3,000. These cases have little bearing upon the present one. In Europe there is not a single line of this kind which justifies a decision based on immediate experience. At the time of the completion of the report, the Chicago, Milwaukee and St. Paul. electrification had not developed far enough to furnish data of value in connection with the St. Gothard line. Further, there has been no opportunity in Europe to experiment with sample direct-current locomotives, which would be particularly necessary, as the manufacturers have not had the occasion to construct locomotives which could serve as models. At the same time, generators suitable for heavy direct-current traction, with large capacity at high voltage, have never been built in Europe. Hence, it was not considered possible to use the direct-current system for the St. Gothard line, because it is not sufficiently perfected in the form necessary, and because the line between Erstfeld and Bellinzona could not be of an experimental nature, nor could it be partially equipped.



The St. Gothard Line, now being electrified.

While stating the above convictions in regard to the single-phase system, the report of the board of managers points out that the experience with high-tension direct-current traction in America and Europe justifies the hope that in the near future it will have a value nearer that of the single-phase system. If the latter had not been available, experiments with the direct-current system for the St. Gothard line would have been recommended. The possibility of using the mercury vapour converter increases the chances of success of the direct-current system, because this apparatus can be properly considered as a means of rendering this system more useful in combination with the alternating-current, which tends more and more to be produced in three-phase form at 50 cycles. This result would be important in the present case, because it is probable that in the near future mercury vapour converters may be constructed for voltages and of capacities to permit substituting them for motor-generators in sub-stations for heavy direct-current traction. Two of these converters, of small capacity and for 600 volts, had been used on a railway in Switzerland with good results.



Profile of St. Gothard Line.

After taking into account all the advantages of three-phase, 50-cycle current, the decision was reached to generate single-phase current in the Amsteg and Ritom power stations. The influence that the choice of system by the federal railways would have on the relation of the power plants of the country to the railways was not overlooked. The railways could, of course, use standard primary power with the single-phase system, and even with the direct-current system, by the use of sub-stations. However, the desire to avoid the transformation of the power from three-phase to single-phase form finally led to the conclusion already mentioned.

It was decided also to plan the two power stations so that when fully equipped they can supply power for the entire line from

Lucerne to Chiasso. It is expected that means will be found to utilise the surplus power of these plants in spite of its form and frequency, even if it is necessary at first to transform the greater part of the power. Later the entire single-phase capacity at low frequency will be needed for traction purposes.

We are indebted to the *Electric Railway Journal* for our two diagrams.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

To Go—Or Not to Go?

In your issue of the 1st inst., I was much interested in a communication by "Unsettled." His case being almost a parallel with my own, I should like to express an opinion on this important matter.

An unsettled state of mind is our common lot just now, and anxiety with regard to one's future is justified by the problem of "Labour after the War." Like "Unsettled," I can claim a good all-round experience, both mechanical and electrical, and have seriously thought of going further afield in search of better conditions and *pay*.

This war has certainly upset numerous calculations, and nipped in the bud many promising careers. In my own case, though electrical engineering (generation and distribution) is my legitimate calling, I now find myself, through the exigencies of war, a millwright in a "Controlled Establishment."

My problem now is, which is the best course to follow—mechanical or electrical?—many positions require a combination of both. A further course of technical training, commenced before the opening of hostilities, has to remain dormant for the period of the war, owing to lack of time for study.

Undoubtedly, there will be a great demand for engineers, particularly in constructional work, on the Continent after the war.

Taking into consideration the slow pace of our Government departments, and dim recollections of pre-war rates of pay for station engineers—also the present introduction of female labour—it is evident that radical changes in economic conditions are probable, and between Capital and Labour essential. Patriotism is a laudable quality (when not abused by profiteers); then why starve it?

If sufficient inducement were offered, most men would prefer to stay in the "Old Country."

Another point calling for attention is a paragraph appearing under "War Items" in your current issue (8th inst.), entitled "A Labour Exchange Proposal." If that is any criterion of the official attitude towards Labour after the war, then "Go" would be my advice. It is nothing less than a determined attempt at "Conscription of Labour." Our industries are not likely to expand at the expense of the liberty of the individual.

My answer to "Unsettled's" query is the well-worn "Wait and see." Perhaps, by the time peace is declared, Government pledges may be worth more than ink and paper, or the wood comprising platforms.

Nonplussed.

In reply to your correspondent "Unsettled," my advice to him is to clear out at once if he is free to do so. The future does not seem to hold much in this country as regards either status or pay for the coming engineer. Even at the present time (leaving out the dilution of labour) it seems as if the future electrical engineer is doomed. As things are at present some of our labourers are getting wages which would make the station engineer's eyes dance with joy. As for pre-war rates, a good mechanic would run him close.

I will give your correspondent my own experience, which has much in common with his own. After a liberal education and some mechanical experience in the workshops, to my great joy (now sorrow) I found myself in a power station, and hence regarded my fortune as made. This delusion, however, was soon dispelled, as, after serving an apprenticeship and learning the outs and ins of a system of from one volt to 20,000, I find my wages are to be increased by 5s. (pre-war) on my last year's apprenticeship money, with an annual increase of 5s. until a certain figure is reached which is not too high, I can assure you.

Well, this, together with the status which I see some have reached after a service of from 10 to 15 years, has made me determined to clear out as soon as possible. I might also state that the system is one of the largest in England, representing some millions of capital. In conclusion, I wish your correspondent every success should he try his venture 'neath foreign skies.

Balanced Up.

The Rewards of Industry.

One hears and reads, from time to time, advice from various well-known men to those who desire to succeed. One favourite piece of advice is "Make yourself valuable to your employer, and your reward is certain." This, on the face of it, sounds alluring, but the fly in the ointment is—what is likely to be the quality of the reward? I wonder if many of your readers have had an experience similar to mine.

I was the only electrical engineer on the staff of a firm of mechanical engineers. My principal asked me to undertake the design of a certain piece of electrically-operated machinery, for which he wanted to obtain orders. This embodied automatic motor control of a frightfully complicated nature. It was a huge undertaking, as I had no data to work upon, previous attempts by other firms to obtain the same results, up to then, not having succeeded. However, I tackled the work, although inventing did not come within the scope of my duties.

I was occupied on this work, from first to last, for eight years. My worries were multiplied a hundred-fold by the firm foolishly taking orders before the invention was completed. Worse still, they took further orders for more complicated gears, necessitating further inventing work, while I was yet wrestling with the earlier orders already overdue for delivery. And to complete my miseries, they took the later orders, against my advice, on short delivery, with heavy time penalties.

Now, as to the advice "Make yourself valuable, &c., &c.," I was so valuable at this juncture that had I left or died—a not unlikely contingency, as I was nearly driven insane—the firm would have been let in for huge penalties, because, there being no time to make drawings, a newcomer could not have taken up the threads. I carried the whole scheme in my head.

What I went through cannot be imagined or described. For four years I only worked and slept, nothing else, day or night, holidays and workdays alike. I worked while I ate, and thought out details in church on Sundays. I dreamt about "polarised relays," "auxiliary motors," "self-replacing circuit breakers," "contactor switches," and a hundred other things, until my brain reeled. But the gears were delivered, though overdue, and they satisfactorily ran their guarantees. I finished up with racked nerves, injured health, and ruined eyesight. Now about the reward.

My principal offered me the choice of a lump sum or an increase of salary. I chose the latter. Now will it be believed that, on the death of my principal, the business being carried on for the benefit of the widow, I was actually deprived of this increase. I dare not protest at the time, because I knew, from certain information coming to me by a roundabout way, that I would be dismissed if I did so. But, after trying for some time, I secured another post, and then put in a claim for arrears of salary wrongfully taken from me.

The executors, prompted by the person who engineered this injustice, pleaded various thin excuses, all of which I easily disposed of, and they had to admit, in the face of my late principal's offer and award in writing, that I had some moral claim to redress, but, knowing that I was not in a position to take legal action, they turned down my claim on the miserable, petty quibble that I had no legal claim, as I did not court certain dismissal by protesting at first. The executors refuse to say why I was reduced, presumably they cannot say. To every question I put the answer was, "I refuse to reply," or "I decline to discuss it," and I was told that I had no right to know anything, or to demand any explanation.

Finally, I drove the executors into a corner with such an awkward question that the only reply I could get was a refusal to answer any more letters. There the matter stands. I am barefacedly done out of, to me, a goodly sum which I worked very very hard for, I am treated like a felon and refused any explanation whatsoever. Such is my reward.

Now, Sir, can you match this for low-down contemptible meanness? Had I been a "Trade Unionist" my society would have taken the matter up and seen it through, but as it is I am merely an

A.M.I.E.E.

[If the facts are as stated, the writer has our sympathy.—EDS. ELEC. REV.]

SCIENTIFIC AND INDUSTRIAL RESEARCH.

(*Continued from page* 264.)

At the present time activity is as marked in the field of ideas as it is in the field of war. The action of the Government in setting up the new machinery for the encouragement of research was accompanied, if not instigated, by vigorous discussion and debate in the public Press and the learned societies. The useful work which the Royal Society has done for the Government during the war by means of a series of special committees, and the attempts of societies such as the Chemical Society and the Society of Chemical Industry, to arouse an interest in the application of science to industry and the importance of organised effort, led the Royal Society to establish a Board of Scientific Societies. Such a scheme cannot fail to be of value both to science and to the Council's labours.

The British Science Guild has put forth an emphatic manifesto on the importance of science and the need of educational reform. The Teachers' Guild has appointed an Education Reform Council, including representatives of science, industry, and commerce, while Sir Ray Lankester formed a Committee on the Neglect of Science to deal with science in the public schools, the older universities, and the examinations for the Civil Service. The professors of the Imperial College have presented to the Lord President, as

Chairman of their Governors, a memorial dealing comprehensively with the need for a national policy and for a larger output of trained men of science, and at a recent meeting of the Governors of the College he announced that it was the intention of the Government to appoint a special committee under his chairmanship to inquire into the position of natural science in our educational system. At a later date Mr. Henderson made the further announcement in the House of Commons that there would be a reviewing committee which would consider the recommendations of the proposed special committee on science and any other similar committees which might be established to deal with particular aspects of education.

The Advisory Council has been able to assist in the production of special glasses, the making of porcelain for chemical ware and pyrometer tubes, and the erection of research laboratories and workshops in connection with the Stoke School of Pottery. Before the war both earthenware and the cheaper kinds of "bone china" were being driven out of the world markets by the hard continental porcelain, and in June last year the Staffordshire potters appealed to the Board of Trade for assistance in developing the manufacture of hard porcelain to compete with the German and Austrian wares, with the result that the Advisory Council, after full investigation, recommended a capital grant, as well as an annual grant of £2,000 a year for this purpose.

Another industry which has suffered much from foreign competition is that of silk. The Silk Association formed a strong representative Research Committee, and the first of a long list of problems is now to be attacked at the Imperial College.

There is growing evidence that many of the most enlightened firms engaged in prosperous industries are alive to the need for long views. The engineering trades have always been able to hold their own, yet they had become convinced before the war that association was necessary, especially in the markets of China and Russia, if they were to compete successfully with Germany. The Council understands that the British Engineers' Association, like the British Electrical and Allied Manufacturers' Association, intends to include the prosecution of research among its activities. The so-called price associations are likely in many cases to extend their functions in this way. In other cases special organisation may be necessary. Representatives of over 100 firms engaged in chemical industries have resolved "that it is desirable that British firms engaged in the chemical and allied trades should form an association to promote closer co-operation, and to place before the Government the views of the chemical trade generally; to further industrial research; and to facilitate closer co-operation between chemical manufacturers and various universities and technical schools." A Council for organising the British engineering industry formed in Manchester last year has recently combined with the British Engineers' Association; it appointed a committee to consider engineering education and research which has declared it to be one of its functions "to develop co-operation between engineering firms on the one hand and universities and technical colleges on the other, so as to establish such 'schools of thought' as exist in the research departments of great continental and American engineering firms, but cannot be fostered in the comparatively small establishments (and smaller research departments) of most British engineering concerns." This sentence strikes a new note, for it bases the need for co-operation upon the comparatively small scale of British commercial enterprises.

The Council has found that many scientific industries are completely without any effective trade associations through which their common manufacturing interests and difficulties can be approached. It is evident, however, that the difficulties of tradition, trade organisation, and national temperament which stand in the way of combination must be squarely faced if progress is to be made. Even those trade associations which exist have hitherto shown but a moderate appreciation of the necessity for research as a means of keeping command of the market, unless they see their trade in actual danger. So long as an industry was prosperous it was apt to take short views and feel little enthusiasm for systematic research, especially if the firms it comprised were small, or if the capital engaged had a speculative value on the Stock Exchange.

The Council has sometimes found that manufacturers were unwilling to try new developments because they appeared to lack any ambition for extension so long as their existing plant was fully occupied. A good deal of the inertia which British manufacturers have shown towards research may have been due to a realisation, partly instinctive perhaps, but partly based on experience, that research on the small scale they could afford was at best a doubtful proposition. This is one of the principal impediments in the way of the organisation of research, with a view to the conduct of those long and complicated investigations which are necessary for the solution of the fundamental problems lying at the basis of our staple industries.

The Council is aware, however, that there are substantial considerations in the minds of many manufacturers which lead them to hesitate in expending large sums for research of a comprehensive kind. They have complained that the recent substitution of the joint stock bank for private banks has hampered enterprise, because the modern bank authorities are not acquainted with the personnel and policy of local firms and are not prepared to finance new undertakings and developments in the same way that the private banks did. It has been said that it is no longer possible for a man to raise money on his character, and that the conservatism of English banking, for which there is good reason and justification, makes it peculiarly difficult for any but the largest British manufacturing firms to compete successfully for contracts in foreign markets where long credit is often customary. This difficulty led the British Engineers' Association shortly before the war to take steps to form an Engineers' Trust, which would be supported by the firms belonging to the Association and furnish the necessary credit, and the Board of Trade has established a Committee "to consider the best means of meeting the needs of British firms after the war as regards financial facilities for trade, particularly with reference to the financing of large overseas contracts, and to prepare a detailed scheme for the purpose."

Great businesses can afford a run of unsuccessful trials, because in the end a solution will pay all the costs and put them ahead of their competitors. Powerful joint stock companies generally look forward to a distant future, and pursue a far-seeing policy. "They are seldom willing to sacrifice their reputation for the sake of a temporary gain; they are not inclined to drive such extremely hard bargains with their employés as will make their service unpopular." This last point is of great importance, for the assistance and goodwill of the worker are essential to the promotion of industrial research.

The Council has repeatedly been told, when it has urged the necessity for expenditure upon research with a view to improvements and developments, that there is no security that new ventures will not be left, when peace comes, to shift for themselves as best they may in face of the highly organised competition of our enemies. Organisation can only be fought by counter organisation, and so long as the Englishman treats his business house as his business castle, adding to its original plan here and there as necessity or inclination directs, with his hand against the hand of every other baron in his trade and no personal interest in the foreign politics of his industry as a whole, it will be as impossible for the State to save him, whether by research or other means, as it would have been for King Stephen to conduct a campaign abroad. In the main the State can only effectively help those who help themselves.

It appears to be incontrovertible, however, that for those industries at least which are essential to the conduct of other important national activities and which are both scientific in their character and relatively small in bulk, there is very little chance of survival unless special means are taken by the State to safeguard them. These are the scientific industries—sometimes called key or pivotal or master industries—which can never employ a large proportion of the population because the bulk of their products needed for the world trade is inconsiderable; and yet without them many other trades would languish or die. If a particular product is essential to the national safety the case for State action will be stronger than if it is not. If the trade to which the product is a "key" is relatively unimportant the case will be relatively weak. It may be desirable for the State to take special pains to encourage those scientific industries which are recognised to be essential to the national well-being, and to assume a greater responsibility for the cost of the necessary research for these industries than would in ordinary cases be admissible.

(To be concluded.)

LEGAL.

Accepting Part of an Order.

In the City of London Court, on September 7th, before his Honour Judge Rentoul, K.C., a claim was made by Mr. W. Schonfield, trading as Schonfield & Co., London, iron merchant, against Messrs. Waters & Burgess, motor body builders, St. John Street, E.C., to recover £16 6s. 9d. for 42 gross of nuts and bolts supplied for use in motor ambulances.

Mr. Greenwood, plaintiffs' solicitor, said that as the defendants did not get all the goods which they ordered, they thought they ought not to pay for those which they had received and used in motor ambulances. Under Sec. 30 of the Sale of Goods Act, where the seller delivered to the buyer a quantity of goods less than he contracted to sell, the buyer might reject them, but if the buyer accepted the goods so delivered, he must pay for them at the contract rate. He would assume that that was what happened, although he did not admit it, for it was not so. The nuts and bolts were delivered in December. Seven or eight applications were made in writing for payment. Defendants never replied to them and never set up any defence until applied to before the summons was issued by a trade protection society. Sec. 35 provided that the buyer was deemed to have accepted the goods when he intimated to the seller that he had accepted them, or when the goods had been delivered to him, and he did any act in relation to them which was inconsistent with the ownership of the seller, or when, after the lapse of a reasonable time, he retained the goods without intimating to the seller that he had rejected them.

Mr. Waters, one of the defendants, told the Court that plaintiffs' representative compelled them to order more nuts and bolts than they

really required. When the goods were sent they were less in quantity than were ordered, and at the bottom of the plaintiffs' invoice it said "regret we are temporarily out of items omitted." He had had to make the bolts which plaintiffs had not supplied, at a greatly increased cost, as they were for motor wagons wanted in the ambulance service. Surely plaintiffs ought to bear some of that extra expense!

Judge Rentoul said that was not so. Defendants could have rejected the goods which were delivered without any difficulty, and obtained the whole order by buying elsewhere against the plaintiffs. Defendants chose to take part of them; they should have said they would have none of them. They could have bought all the goods against the plaintiffs and sued them for the difference. Judgment for the plaintiffs with costs.

Munitions Court Cases.

The Oldham Munitions Tribunal last week had before it a case in which an electrical fitter applied for a leaving certificate from his employers—a local firm of engineers—because he had been debadged by the firm. He had another situation to go to at a controlled works, and he submitted that the action of his present employers in debadging him showed that they considered he was no longer on war work. A representative of the firm said they did not wish to part with this man until the Army claimed him, but he had been debadged by order of the Ministry of Munitions. The leaving certificate was refused, Mr. James Hodgson (chairman) stating that if they were to grant certificates to all men who were debadged, the Army authorities would have trouble in finding them.

Workmen's Compensation.

Judge Spencer Hogg, sitting at the Wigan County Court last week, heard an application by Minnie Eastmead, widow, whose husband, Chas. E. Eastmead, an electrical worker, had been killed and whose employers had paid into Court £300. The widow was left with three children, and his Honour made an order for the payment of £20 down, £2 10s. a month for two years, and for £100 to be invested in the War Loan.

WAR ITEMS.

Exports to China.—The "London Gazette" for September 8th contains a further list of names of persons to whom articles may be exported in China.

Export Prohibitions.—The "London Gazette" for September 8th contains additions, removals, and variations of the lists of persons or bodies of persons with whom trading is prohibited in Argentina, Bolivia, Brazil, Japan, Netherlands, Norway, United States, and other countries.

X-ray Scientist's Sacrifice.—A young scientist who has distinguished himself by his fruitful research work in connection with X-rays, M. Maxime Ménard, has had one of his fingers amputated as the result of injuries caused by the rays. M. Ménard had already lost a finger from the same cause before the war. His studies have greatly facilitated the rapid discovery of bullets and shell splinters embedded in the bodies of wounded soldiers.

Patent Rights in Austria-Hungary.—According to the *Neue Freie Presse* (Vienna), an Austrian Government Order of August 16th empowers the Minister of Trade to limit or cancel the patent rights and the rights in registered designs and trade-marks of British and French subjects, on proof that such a course is for the public interest, and the rights of Russian subjects without such proof. Royalties for the use of patent rights will be charged, and the sums obtained disposed of by the Minister of Trade—probably on the same principle as in the United Kingdom.—*Financier.*

Russian Government to Regulate Electric Concerns.—The Minister of Trade and Industry has submitted a project of regulations to the Council of Ministers on the construction and maintenance of electric transmission plant. The object of the project is to provide encouragement for the formation of Russian electrotechnical enterprises. The Minister of the Interior has also submitted a project to the Council of Ministers embracing rules for the organisation of the control of electrotechnical equipment in the Empire.

The Ministry of Munitions.—The following changes in the office organisation of the Ministry of Munitions are announced:—

Sir Glynn West will in future be directly responsible to the Minister for the conduct of his department, which deals with the manufacture of shells and their components. His title will be Controller of Shell Manufacture. Mr. H. Fowler will accordingly be designated Deputy Controller.

The branches dealing respectively with the supply of metals, coal, and other materials, and with machine tools, will work immediately under the Director General of Munitions Supply. Mr. Leonard Llewelyn and Mr. Alfred Herbert thus become Deputy Directors-General. Mr. John Hunter has become responsible for the branch which deals with the production of steel.

Enemy Goods in Australia.—Reuter reports from Melbourne that the Government recently decided that enemy goods imported before the war must not be sold by wholesale houses after September 30th nor retail houses after November 30th. The dates have now been extended in the one case to October 31st, and in the other to December 31st.

To be Wound Up.—The Board of Trade has ordered the following companies to be wound up:—

Switchgear Construction Co., Ltd., Park Street, Southwark, S.E., electrical engineers. Controller: J. H. Stephens, 6, Clement's Lane, E.C.

Turner & Burger, 149, Farringdon Road, E.C., electrical accessories merchants. Controller: J. E. Percival, 6, Old Jewry, E.C.

Enemy Firms in Italy.—Enormous amounts of German and Austrian property in Italy are affected by the Decrees regarding the sequestration of enemy concerns. Amongst the latter are the firm of Röckling, with a stock of iron and steel valued at £40,000, the Milan Krupp Works, and the Austrian firm of Ganz & Co., which, under the guise of an Italian company, held a very important contract for the supply of electricity to Rome from the River Anio.

Employment of Aliens.—An Order in Council makes the following addition to the articles under the Aliens Restriction (Consolidation) Order, 1916:—

As from and after October 1st, 1916, a person shall not take steps to obtain the services for work other than munitions work in the United Kingdom of aliens or any alien not in the United Kingdom except with the permission in writing of the Board of Trade, and subject to such special or general conditions as the Board of Trade may impose.

British Property in Germany.—British subjects who own property in enemy territory, or have claims to prefer against enemy Governments or persons, are called upon by a recent Royal proclamation to submit details of such interests or claims at once to the authorities, unless they have already voluntarily made such returns. The officers appointed to receive such returns are:—

(*a*) In the case of property in enemy territory and of claims against enemy persons, the Public Trustee, Kingsway, London, W.C.

(*b*) In the case of claims against enemy Governments, the Directors of the Foreign Claims Office, Foreign Office, London, S.W.

Foreign Capital in Spain.—An interesting survey of the magnitude of foreign financial interests in Spain from the standpoint of the industrial development of the country has just been published in Madrid. It refers to joint stock companies domiciled abroad and carrying on industrial works in Spain, and shows the astonishing fact that out of the total amount of £73,400,000 invested by foreign companies for these purposes, the shares held by Germany does not reach £1,000,000. The following figures are worthy of note as indicating the amounts invested by the nations concerned in the industries mentioned:—

	£
Electric Lighting.	
Belgium	160,000
France	372,000
England	5,062,000
Total	£5,594,000
Railways and Tramways.	
Belgium	2,939,000
France	4,136,000
England	365,000
Total	£7,440,000
Metallurgical Industries.	
Belgium	240,000
France	240,000
England	25,000
Total	£505,000
Mining Undertakings.	
England	14,459,000
France	7,014,000
Belgium	2,766,000
Germany	800,000
Switzerland	104,000
Total	£25,143,000

We leave out of consideration other industries in which foreign capital is interested, but sufficient has been shown to demonstrate the enormous preponderance of the Allied nations in the industrial development of Spain. Under these circumstances, it is scarcely surprising to find the Madrid *Mundo* asking what would happen if through Spanish hostility towards the Allies the latter were to withdraw from the country such an immense sum as is cited, and which has so largely contributed towards the economic advancement of the country. The newspaper states that, after reading the figures and meditating on them, no one who has the welfare of the country at heart could possibly believe in the adoption by Spain of a Germanophile policy at the present time.

The Russian A.E.G.—The Russian A.E.G., whose works until the beginning of the war were situated at Riga, whence the machinery and plant were subsequently removed into the interior, is reported to have experienced a satisfactory period in 1915 as a result of the work carried out at the new site, where operations are exclusively devoted to Army requirements. A new war department, at a cost of £150,000, was established last year, together with a special artillery department. The import of foreign materials and parts, the lack of which formerly interfered with the activity of the works, has now assumed a regular course, the company for this purpose having entered into relations with the United States General Electric Co. and the British Thomson-Houston Co. After allocating £47,000 to the depreciation fund, the accounts for 1915 show net profits amounting to £223,000, as compared with £206,000 in 1914, and it is proposed to pay a dividend of 10 per cent. on the share capital of £1,200,000, being the same rate as in the preceding year. It has been decided to increase the share capital by £1,200,000 to £2,400,000, although the first instalment of the new emission will comprise £800,000. An addition has been made to the company's statutes in the sense that only directors who are Russian subjects will be entitled to be present at general meetings. The German banks, which formerly issued Russian A.E.G. shares in Berlin, are watching developments in connection with the new issue of shares with a view to safeguarding, as far as possible, the interests of present Teutonic shareholders.

The South African Siemens Company.—According to several newspaper reports which have been sent to us, the directors of Siemens, Ltd., applied in July, to Judge-President de Villiers in the Rand Division of the Supreme Court, for an order to place the company in liquidation. They declared that they were not prepared, in view of the fact that all the shares were registered in the names of enemy subjects, or were in the possession of the Deutsche Bank, to accept the responsibility of continuing in office. The directors further declared that it was found, in the circumstances, impossible to carry on the business of the company. They, therefore, had resolved to petition the Court to put the company in liquidation, considering that it was just and equitable that the company should be extinguished.

Mr. MacWilliam, who appeared in support of the company's petition, stated that although there was no necessity to do so, the directors had notified the Treasury that the application to the Court was being made, and the Treasury had replied that the Department would not object to the liquidation provided that all moneys realised on behalf of enemy shareholders should be paid to the Treasury.

The Court granted a provisional order of liquidation, the Judge-President observing that as the nature of the application was without precedent, he thought the Court should name a fairly distant return date. The rule was made returnable on October 26th. Mr. J. V. Stanton was appointed provisional liquidator. Mr. Stanton was appointed manager of the company when Mr. E. G. Weyhausen, then manager, retired, on being placed in internment at the Martizburg prisoner-of-war camp, from active participation in the affairs of the company.

Mr. J. V. Stanton, the provisional liquidator, writing to one of the newspapers referred to, says:—

"The resolution that an endeavour be made to place the company in liquidation was passed on February 5th last, *i.e.*, prior to the introduction of the Trading with the Enemy Bill. The delay in filing the petition was due to the necessity of bringing certain existing contracts to a stage which would allow of liquidation. Further, this resolution was passed at the first meeting after the local directors received their first intimation from Messrs. Siemens Bros. Dynamo Works, Ltd., London, that Siemens, Ltd., had ceased to be a branch of the former company. Up to that date Siemens, Ltd., had always been in the position of a branch of Siemens Bros. Dynamo Works, Ltd., by whom the local management had been appointed, and by whom the business of Siemens, Ltd., had been controlled.

"The local directors have not been endeavouring to lengthen out the business for the benefit of enemy shareholders, but have taken the first possible opportunity—since they became aware of the true position of the company—to apply to the Court to relieve them of their false position and to allow them to place their assets at the disposal of the Treasury."

A Colliery Plant Shut-down.—Captain R. G——n, who is in France, writes us as follows:—"This area absolutely teems with items of engineering interest, and I really think that if I survive the war I shall have to conduct an Institution Summer Meeting round the various places. For instance, yesterday, my professional instinct being (for the nonce) superior to that of personal safety, I crawled into the engine-room of a colliery which had adopted electrical winding, about 600 yd. from the Bosch. Meter cases and oil switchgear lay all over the floor, a 25-panel grey marble switchboard had a shell-hole through the middle, leaving meters, synchroniser, and feeder switches at all angles, and a tangled mass of bus-bars behind. The motor of a large induction motor-driven pumping set had left hurriedly, half of the magnet case, and some of the shaft, remaining more or less in place. The stator winding of the main winding set had received a fragment of H.E. into its bosom, while 12 in. and 18 in. cast-iron pipes were well ventilated. Stewart, who was with the Westinghouse, naively remarked: 'I suppose it's all dead'! This week the French have installed static transformer gear in a dug-out on the lee side of a railway cutting, about 6,000 yd. from the Bosch, and intend operating an old 6,000-volt pole line to another colliery almost immediately—a definite proof of their optimism."

Moscow and the 1886 Co.—The "Novoie Vremya" says that the Moscow Chief, M. B. Chelnokoff, has returned there from Petrograd, where he had been to consult with the competent authorities on the town's relations with the 1886 company. The President of the Council of Ministers, B. V. Sturmer, said that he had not changed his attitude towards this company, and he considered its liquidation a matter of the near future. The Ministers of the Interior and of Justice expressed themselves as quite sympathetic to the town. Important conferences took place with other interested bodies, and M. B. Chelnokoff received everywhere assurances that the matter would be settled soon in a way favourable to the town of Moscow.

Exemption Applications.—At Warrington, an electrician at the Star Kinema House, aged 28, and married, who was appealed for by his employers, was allowed a further two months' exemption. He was prepared to work part time on munitions.

At Wigan, a firm of electrical engineers, appealing for a man aged 21 years, said that 23 of their employés had joined the Colours, and Mr. H. Brierley (Military representative) said the firm had done very well in this respect. The firm's representative said they had advertised for electricians, but without success, and they had work held up now. It would be difficult to manage without this man. One month's conditional exemption was allowed. Conditional exemption was granted to three other employés of the firm, aged 28 years, 38, and 39 respectively.

The Rochdale Tribunal granted conditional exemption to Mr. J. K. Cotton (34), electrical contractor, and exemption until October 31st to Mr. Harry Jones (32), electrician at a local place of amusement, who was appealed for by his employers.

The Mossley Tribunal exempted Wilfred Kershaw, electrician at the Royal Pavilion, until October 31st.

At the Oxford Local Tribunal, Elizabeth Storey, Oxford, applied for the renewal of the certificate granted to Stanley A. Stock (24), electrical engineer; he had been granted exemption in June to September 1st. The applicant was still unable to get a substitute in order to release the man for service. Mrs. Storey depended on the business for her means of livelihood, and if the man were taken it would mean closing down, and her means of livelihood would be absolutely gone. Temporary exemption granted for two months, no further application to be made without leave of the Tribunal.

An appeal was made at Bedford by the Igranic Electric Co. for F. Morris, a time-expired soldier, who became 41 on September 4th. The Clerk asked if the military wanted a man who had served 22 years with the Colours and was 41 years of age, and the Military representative replied that they wanted all the men they could get, or they would have to raise the age. The firm said theirs was a controlled one, and the man's work was beyond a woman's physical capacity. Exemption was granted until December 1st.

At Woking, the Electric Supply Co. appealed for the chief clerk, A. M. Dallen (29), and the only meter tester and repairer left, A. J. Jamieson (34). The secretary, Mr. Nicholson, said the chief clerk had technical knowledge which it would take any substitute a long time to acquire. Exemption was refused in the case of Dallen, and notice of appeal was given; Jamieson was conditionally exempted.

Barnsley Tribunal, on September 5th, gave conditional exemption to a number of employés appealed for by the Barnsley & District Traction Co., Ltd., but refused appeals for a driver, aged 28, and another employé aged 34.—The same Tribunal gave three months' temporary exemption to Guy P. Dearden, electric wireman with Mr. E. Broley, who is engaged on public contract work, and to Harry Brown, electric wireman with Messrs. S. Rushworth & Son.

Bath Tribunal has given conditional exemption to A. C. Brackstone (39), electrical fitter with Messrs. Kendall, on condition that he obtains munition work within 14 days.

An appeal at Reigate for the retention of E. C. Reynolds (28), the only electrician left at the Redhill Kinema Royal, resulted in a fortnight being allowed to find a substitute. The appeal was based on the fact that the kinema paid £2,000 a year in excise duty, taxes, &c.

At Carlisle, Fred Bell (32), electric fitter, was appealed for by the Electric Illuminating Co., who stated that the man was at present engaged on important work for the Control Board. The staff before the war numbered 10; now there were only two. Exemption was granted until December 1st to enable the Control Board work to be proceeded with.

At Marlow, on September 4th, the Military representative asked for the removal from the certified list of Mr. A. E. Plumridge, electrical engineer. Mr. J. G. Meakes, the employer, said that Mr. Plumridge was indispensable. His staff had been reduced from 15 to five, and he was the only one appealed for. It was admitted by the Military that Mr. Plumridge was clearly in a certified occupation, but he con-

sidered that, in the national interests, he should not remain in civil life. The Tribunal refused the request.

At Great Missenden (Bucks.), Mr. R. B. Bridger, electrician, a member of the Plymouth Brethren denomination, appealed as a conscientious objector. He admitted that it would be his duty to defend his wife with a rifle if it was necessary, and, in dismissing the appeal, the Chairman said that by defending his country Mr. Bridger would be defending his wife.

At Coventry, the Corporation Tramway Department appealed for a number of employés. In each case two months' exemption was conceded, with the suggestion that men above military age capable of doing the work should, if possible, replace all single men.

At Bispham Tribunal, Mr. J. Cameron, general manager of the Blackpool and Fleetwood Tramroad, applied for the exemption of 11 employés, including an inspector. He had not appealed for the exemption of any summer man. Conditional exemption granted.

An electrician appealed to Burnley Tribunal for temporary exemption for an electrical wireman. He was the only qualified man left, three having joined the Flying Corps. His foreman had gone working in a coal mine as an electrician. This man was doing contract work at Sheffield. Captain Smith said that men of this description could be got any day. They were only labourers. The appeal was put in on May 6th. Exemption until the end of September was granted.

Deal Tribunal has given two months' exemption to Chas. Henry J. Graves (24), who has the care of the electric plant, &c., at the South-Eastern Hotel, and who does electrical repairs for private residents, and for the X-ray apparatus at the Royal Marine Infirmary.

At Coventry, Mr. J. Hutt (32), electrical engineer and contractor, stated that he now carried on the business by himself, and was doing work for munition factories. It was stated that there was a scarcity of skilled electricians in the city. Three months were granted, Mr. Hutt to put in weekly 12 hours' duty as a Special Constable.

Maidenhead Tribunal has refused extended exemption to Frank Burdett Burnham (36), electrician with Mr. H. Rose, who said that he had contracts to last until October.

Three months' exemption has been allowed to Thos. White (31), electrician, appealed for by Messrs. Page & Bloomer, of Stourbridge, as being in a certified occupation.

A final month has been granted at Coalville to an electric operator at a picture theatre at Whitwick.

The Crawley Electrical Co. appealed for an electrician and fitter, previously medically rejected, and now passed for general service, but exemption was refused.

Buntingford Tribunal has given exemption until the end of September, to allow him to complete electrical work in hand, to Mr. P. J. Mac Kay.

At Malvern, the U.D.C. electrical engineer (Mr. S. Trow Smith) appealed for Wm. Thos. Powell, fireman, previously temporarily exempted. Conditional exemption was now granted.

The Blackburn Tribunal has granted conditional exemption to a married motorman employed by an electrical engineer, and said to be in charge of special electrical equipment at a large works at Darwen.

At Tunbridge Wells, Mr. Strange and Mr. Featherstone appealed for R. J. Spittles and R. F. Lack, working foreman and electrical wireman. It was stated that the electrical contractors for the town loaned the men one to another in order to keep as few men as possible in the town to carry out the work of maintaining the supply. They also had increased work at country houses owing to the calling-up of electricians. Each was given two months on the men joining the Volunteer Training Corps.

Epsom Rural Tribunal has granted two months' exemption to Mr. E. W. Morris, electrical engineer, of Barnett Wood Lane, Ashstead.

Extended exemption was sought at Leatherhead, on September 1st, by Mr. M. Morris (33), manager for Messrs. Buchanan & Curwen, electrical engineers. Appellant is passed for sedentary work only, and the Military representative (Mr. H. J. Rivington) said he did not object to exemption until the new year. Mr. Morris stated that he had been passed for home service only. One of the partners, Mr. Curwen, was taking up a commission in the Royal Flying Corps, and he wished him (appellant) to take his place entirely in London as well as at Leatherhead. The Tribunal granted until the new year on appellant joining the Volunteers.

The Burgess Hill (Sussex) Tribunal has granted six months' exemption to a member of the staff at the electric light works on condition that he remains in the same occupation and joins the Volunteers.

At Blackpool Tribunal, in the case of a foreman electrician employed at the Pleasure Beach, his employers stated that he was the only electrician they had left. He had been rejected at Lancaster, and then called up. Conditionally exempted.

At Crompton (Lancs.), an electrician at a local kinema hall appealed for exemption, and said he had served 13 years in the Army, and was in the retreat from Mons. He was exempted until January 1st.

At the Shoreditch Tribunal, on Tuesday, Messrs. E. & C. Whitney, of City Road, N., electrical engineers, asked for exemption on business grounds for James Green (37), electrical fitter. Mr. Whitney said they had one other electrical fitter in their employ, aged 40 years, and they were doing a lot of installing and fitting for the Government. As he was an electrician doing power work, they applied to the Ministry of Munitions for a badge, but it was not granted, a certificate being considered sufficient. The Chairman: So it is; it is a certified occupation. The only thing is, does Green do the same class of work? Mr. Whitney: Identical work. Green appeared and said that he had been engaged for a long time in installing power in Government factories and premises. Mr. Parry said that the firm did not seem to understand that this man was in a certified occupation.—Exemption was granted till December 31st, conditional on joining the V.T.C.

At Orsett, an electrical engineer at Little Thurrock claimed exemption as owner of a one-man business. The appeal was rejected, and the calling-up delayed for a month.

The Blackpool Tribunal has disallowed an appeal by an electric motor builder (36), now engaged as a mechanic, who said he was the sole support of his aged mother.

BUSINESS NOTES.

Patent Restoration.—An order has been made restoring Letters Patent No. 25,363 of 1907, granted to Arthur Greenwood and Konrad Andersson for "Improvements in ejectors and compressors for air gases and vapours."

Mazda Telephone Directory Cover.—We have received from the British Thomson-Houston Co., Ltd., of Mazda House, a telephone directory cover devised on an ingenious principle, so as to hold the directory firmly without tearing the binding. The senders claim that "it is as big an advance over previous covers as Mazda drawn-wire lamps are over previous types"; and certainly it is an excellent and easily-applied protection to that indispensable and long-suffering volume.

Irish Battery Industry.—Referring to the note on p. 237 of our issue of September 1st, regarding the opening of a large factory in Dublin for the manufacture of electric dry cells and batteries, we are informed that Mr. Leon Cornelis, of 15, D'Olier Street Dublin, will be pleased to give further particulars to inquirers.

Electrical Imports of Venezuela.—The imports of electrical appliances into the Republic of Venezuela during the fiscal year 1914-15 only attained a value of £16,999, as contrasted with £39,989 in the preceding 12 months.

Italy.—A new company has lately been formed in Turin, with the title La Società per la Fabbricazione di Batterie Elettrichi Brevetto Bonora to manufacture electric batteries under the Bonora patents.

Catalogues and Lists.—Messrs. Herbert Morris, Ltd., Empress Works, Loughborough, Leicestershire.—Book 95, describing the "2,240 pulley-block"—an American type, made at the Empress Works to carry British tons (the American ton is 2,000 lb.). Travelling blocks and the H.M.B. pulley-blocks are also described.

Messrs. S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.C.—Leaflet describing and illustrating the "Selco" siren, which is electrically operated and designed for use in factories, workshops, yards, quarries, lightships, &c.

Wholesale Electrical Co., Ltd., 54-56, Oxford Street, London, W.—Circular giving illustrations of a number of electrical accessories, switch plugs, cut-outs, ceiling roses, adaptors, lampholders, &c.

Messrs. Downes & Davies, 1 and 3, Stanley Street, Liverpool. Preliminary list of ships' electrical fittings—bulkhead, portable, cargo lamps and sockets, &c.

Holophane, Ltd., 12, Cateret Street, S.W.—Booklet relating to Holophane special reflectors for the scientific illumination of railway platforms, offices, sidings, rolling stock, &c., with illustrations of important installations on this system.

Trade with Russia.—The Yorkshire effort for the stimulation of trading with Russia is making excellent progress. For students in the scheme of the Leeds University who make good progress, scholarships are to be provided of about £200 each for a year's residence in Russia for studies under the direction of the Russian Minister of Education at the Universities of Petrograd, Moscow, and Odessa, and for the practical experience to be derived from contact with the populations of those centres.

E.C.C. Hospital Fund.—The employés of the Electric Construction Co., Ltd., Wolverhampton, have made allocations from their hospital fund to local and other hospitals to the tune of £173.

Norway.—An amalgamation has been arranged between the Norwegian Motor and Dynamo Factory, Hasle, near Christiania, and the firm of Per Kure, and the combined establishment will in future trade as Per Kure, Norwegian Motor and Dynamo Factory. The capital of the company, which has taken over the Norwegian agency of the Swedish General Electric Co., is approximately 2,000,000 kr.—*Anglo-Norwegian Trade Journal.*

Book Notices.—"The Principles of Electrical Engineering." Vol. I. By G. Kapp. London: Edward Arnold. Price 15s. net.

"Directory and Chronicle for China, Japan, Corea, Indo-China, Straits Settlements, Philippines, &c., for 1916." London: *Hong-Kong Daily Press*. Price 30s. net.

"Telegraph and Telephone Journal." Vol. II. No. 24. September, 1916. London: Editing Committee, G.P.O. North. Price 3d.

"British and German Industrial Conditions." By A. Stewart. London: S. Rentell & Co. Price 6d.

"Alternating Currents." By W. H. N. James. Cambridge University Press. Price 10s. 6d. net.

Australia. — A business man in Sydney recently in charge of the Sydney Office of H.M. Trade Commissioner, wishes to represent United Kingdom manufacturers for the sale of their goods in Victoria, New South Wales, and Queensland. The inquirer desires to secure agencies for small oil engines of the Diesel type, small electric motors ($\frac{1}{16}$th H.P. and upwards), small dynamos, and new hardware lines and patented specialities.

United Kingdom manufacturers may obtain the name and address of the inquirer on application to the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C. (Reference No. 283.)—*Board of Trade Journal*.

Liquidation. — MECHANICAL TRANSPORT, LTD. — Creditors should send particulars of their debts, &c., to the liquidators, Messrs. G. W. Askew & H. W. Philpott, by September 28th.

Munition Workers' Holiday.—MESSRS. E. BROOK, LTD., of Huddersfield, announce that their works will be closed both for the receiving and dispatching of goods on September 25th and 26th. They will be open all other working days up to Christmas.

LIGHTING AND POWER NOTES.

Aberdeen.—The city electrical engineer recommended that a new five years' contract be entered into with the North of Scotland Fish Guano Co. for a supply of power, with a guarantee of 100,000 units per annum. The result of the new charges proposed was that the company would pay, with coal at its present rate, an increase of 48 per cent. on the existing charges. At a meeting of the Council the recommendation was sent back to the Electricity Committee for further consideration.

Accrington. — At a meeting of the T.C. last week, Councillor Tough referred to the increasing cost of electricity; he remarked, that with less than half the production of Accrington, the average cost last year at Rawtenstall was ·6d. per unit. for 3,000,000 units, compared with an average of ·81d. for 7½ million units at Accrington. It was pointed out that a strict comparison could not be made, and that coal cost 18s. 10d. now as against 8s. 4d. per ton before the war.

Australia.—The Electric Lighting Committee of the Sydney City Council recommends that an agreement be entered into with Messrs. Norton, Griffiths & Co., contractors for the city railway construction, to supply them with electricity at the various shafts at ·7d. per unit for two-shift working and ·85d. per unit when one shift only is worked. The estimated cost of providing the supply is £4,335.

The Sydney city electrical engineer recommends that an order be placed with Messrs. Willans & Robinson for a geared turbine to couple with the alternator and condenser of the existing 4,000 KW. set (No. 8), at a cost of £8,100; the cost of freight, insurance, and erection of buildings, &c., will amount to an additional £1,900.

The city electrical engineer has informed the Hurstville Council that under existing circumstances it was unlikely his Council would entertain the proposal to supply electricity to the suburb, and he recommended a renewal of the application in about 12 months.

The formal inauguration of the electric lighting system at Albury, N.S.W., took place last month.

With a view to improving the lighting of St. Kilda's Road, the Melbourne City Council has decided to erect 49 arc lamps or half-watt lamps of equal C.P.; the additional cost on the system will be £777, making a total cost of £1,267.—*Tenders*.

Bath. — YEAR'S WORKING. — The accounts of the electricity undertaking for the year ended March 31st last, show that instead of the anticipated loss of about £2,000, the deficit for the year was only £151, as compared with £1,767 in the previous year. The total revenue was £26,490, as compared with £24,133 in 1914-15, and the gross profit £12,961 as against £11,436. Coal cost was increased by £845, due to price, not tonnage.

Bishop's Stortford.—E.L. SCHEME.—At the annual meeting recently of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Co., the chairman stated that the electricity plant was now in complete working order.

Bradford.—NEW PLANT.—The Electricity Committee has authorised the chairman and deputy-chairman to purchase coal-crushing plant.

Bristol.—YEAR'S WORKING.—The report of the year's working of the electricity department to March 25th last, shows gross receipts amounting to £132,928, an expenditure of £72,292, and a gross profit of £57,636, which, with the amount transferred from redemption and sinking fund (No. 2) account, makes a total of £58,184. After repayment of loans and interest, £50,273, there was a net profit on the year's working of £7,911, which, with the balance from last account, makes a total surplus of £15,721. Of this, £2,391 has been expended on allowances to men on active service, and £4,038 on work not chargeable to loan account, leaving a balance carried forward of £9,292. The total indebtedness of the undertaking is stated to be £899,062. Loans repaid or accumulated in the stock and loan redemption funds, £382,139; balance outstanding, £516,923. The total number of consumers was 5,608, a net increase of 338 during the year. The number of units sold was 21,665,968, an increase of 3,463,812 units for the year.

The general manager, Mr. H. Faraday Proctor, in his report, states that war conditions curtailed considerably the number of new consumers which would otherwise have been connected to the system, but a large amount of work had been carried out in connection with the supply of power. The number of units sold to private consumers (excluding public street lighting) had increased about 21½ per cent., or, after allowing for the reduced consumption for public lighting, a net increase of 3,462,812 units, being the largest annual increase on record.

Owing to confusion having arisen due to the similarity of the names Avonbank and Avonmouth, it has been decided to alter the name of the Avonbank generating station to "Feeder Road Electricity Works." The L.G.B. refused its sanction to a loan for a 6,000-KW. set, which it was proposed to lay down owing the the increasing demand, and authorised the purchase of a 3,000-KW. set only, the manufacture of which plant was placed on a war basis; the steam turbine, which was in a forward state at the manufacturers, has since been taken over by the Government, and a new one put in hand. Both stations have been running loaded to their full capacity, and it has been necessary to postpone the connection of one large consumer requiring 800 KW. immediately, until the new plant is in commission.

The question of the true depreciation of the assets of the undertaking has been carefully gone into, and the results show that the amount shown in last year's accounts is in excess of the statutory provision for the repayment of debt by £76,338.

Castlebar.—PUBLIC LIGHTING.—The Urban Council accepted the tender of Messrs. Burke & Sons, at £90, for the lighting of the town during the winter by electricity. The local gas company had tendered at £130.

Clacton-on-Sea.—The L.G.B. has sanctioned a loan of £124 to meet excess expenditure on mains, but has informed the U.D.C. that no further loans for mains extension will be allowed until the war is over.

Continental.—RUSSIA.—Data published by the Statistical Bureau of the Congressional Council in regard to the electrical equipment at the coal and anthracite mines in the Donetz basin in 1914, shows that 1,300 motors of 46,200-KW. capacity were in use, by 48 concerns which produced 888,910,000 poods of mineral, while 33,910 incandescent and 427 arc lamps were also in use by 51 concerns. Twenty-five generating stations had a total capacity of 31,719 KW. of plant and supplied 100,500,000 KW.-hours per annum.

Crompton.—The U.D.C. has been asked to receive a deputation on the question of supplying electrical power in the district. The railway company, which has been urged to effect an improvement in the handling and transit of goods, has agreed to facilitate matters by providing an electrical crane if power can be supplied.

Dawlish.—ELECTRIC LIGHT CHARGES.—After considering correspondence from the gas company and the electricity company relative to the difference in their respective charges, the U.D.C. has informed the latter that it is unable to see any reason for an alteration of the charges already agreed to.

Dromore (County Down).—STREET LIGHTING.—The U.D.C. has executed an agreement with the Dromore Electric Lighting Co. for the lighting of the town for three years. It provides for 81 lamps, of not less than an average minimum C.P. of 56 or more than 200, the annual cost to be £134.

Dublin.—The Electricity Committee recommended an increase in the remuneration of the shift engineers and switchboard attendants at Fleet Street and Pigeon House stations. The Council decided to postpone the matter until after the end of the financial year.—*Dublin Express*.

Dudley.—The town clerk reported that he had obtained the insertion of a provision in the Shropshire, Worcestershire, and Staffordshire Electric Power Bill, 1916, protecting the rights of the Corporation.

Kirkcaldy.—PLANT CAPACITY.—Mr. Francis, the burgh electrical engineer, has submitted to the T.C. a report on the capacity of the present works and the recent application for a large supply of power by one of the firms in the town—Messrs. Barry, Ostlere & Shepherd. The Fife Power Co. is willing to enter the burgh and supply the power, but is prevented by a clause in the private Act of Parliament. The town clerk, in a statement, observes that the company practically asks that the section referred to be abandoned by the Corporation; this demand, he considers, foreshadows the promotion by the company of a provisional order. He urged that the T.C. should be able to show that it had done all that was reasonable.

Maidstone.—Year's Working.—The report of Mr. E. E. Hoadley, borough electrical engineer, on the working of the electricity undertaking for the year ended March 31st last, shows that due mainly to lighting restrictions and despite considerable expansion in power supply, the output sold fell from 2,887,857 units in 1914-15 to 2,753,788 last year. Power units, however, increased from 1,808,015 to 1,979,582, and heating and cooking supply is steadily growing. The total revenue was £19,771, or rather less than in 1914-15, while total costs at £13,532 showed a considerable increase, leaving a gross profit of £6,239 as against £7,900 in 1914-15. After deducting capital charges there was a net loss on the year of £256 as against a profit of £1,553 in 1914-15.

Increased coal cost accounted for over £2,000, while other items of expenditure were larger than usual. We note with interest that Mr. Hoadley experimented in mixing coke breeze with the coal, which was of bad quality, and came to the conclusion that after allowing for extra labour in mixing, extra wear and tear on mechanical stokers, additional coal and clinker to be dealt with and lowered steaming capacity of boilers, there was no advantage with the particular type of mechanical stoker and under the conditions obtaining, in the admixture of coke breeze; in this conclusion he states that he is confirmed by other engineers. The supply of coal caused much trouble and for some weeks, says Mr. Hoadley, they did well to get over the peak of the load without dropping the steam pressure by more than 40 lb.

A new turbine set which it was hoped to start up in January was not completed by the end of March; all the pipework and electrical connections in connection with it have been carried out by the department owing to the difficulty in obtaining outside assistance. The maximum load was 1,142 KW. and the load factor 27½ per cent.

The Corporation electricity works has been certified as a controlled establishment under the recent Act.

New Zealand.—The Whangarei electrical undertaking, owned by the T.C., is supplied in bulk from the Dominion Portland Cement Co.'s plant at Wairua Falls, 25 miles away, over duplicate aluminium three-phase transmissions carried on a single pole line The transmission pressure is 22,000 volts, and the service pressure to consumers 230 volts lighting and 400 volts (50 cycles) power. A series street lighting system has been installed with 100 lamps of 600, 250 and 100 C.P. The transformer capacity is 400 K.V.A., and the cost of the Council's installation has been about £13,000.

Plymouth.—Restricted Lighting.—A Joint Committee of the Watch and Street Lighting Committees of the T.C. is considering what arrangements shall be made as regards street lighting, having regard to the reversion to ordinary time on October 1st, and the danger to pedestrians and other traffic through unlit streets.

Royton.—The D.C. has decided that arrangements be made for the General Purposes Committee to interview the Oldham Electricity Committee to discuss the question of supply of electricity to the Royton district.

Southampton.—Price Increase.—The T.C. has further increased the price of current for lighting, power and heating by 10 per cent. from the September reading of the meters. This makes an advance of 20 per cent. since the war started.

Stretford.—The Electricity Committee, in view of continued shortage of supplies of coal, recommends the Council to authorise the chairman and clerk to take such action, legal or otherwise, as may be necessary to secure its rights under the coal contract.

Swansea.—Proposed Plant Extension.—The Electric Lighting Committee has received a report from Mr. Burr, the borough electrical engineer, giving details of the existing plant and suggesting that if it were possible to raise the money, a 3,000-KW. turbine, together with two boilers and all auxiliaries should be installed. He estimated the cost of the complete installation at £30,000, and said that the expenditure of this money would have the effect of still further reducing the cost of production, whilst the scheme would enable the Committee to generate electricity as cheaply as any other generating station working under similar conditions. The report was adopted, and steps are to be taken to see if the necessary capital can be raised.

The Committee has also received a report from Mr. J. W. Burr on tariffs for motive power, in which he said that a reduction in revenue would immediately follow a reduction in price, and he could not recommend it at the moment. The Electric Lighting Committee has decided to hire out electrical apparatus at an annual charge arrived at by taking cost of apparatus plus 5 per cent. per annum and cost of maintenance.

Tasmania.—The Councils of St. Leonards, Longford and Beaconsfield, have decided to ask the Launceston City Council to join them in a deputation to the Premier, with a view to discussing the best means of obtaining a hydro-electric power scheme for Northern Tasmania.

Wakefield.—Electric Pumping.—The R.D.C. has decided to supply water to Crigglestone, by means of an electrical pumping plant. The cost of the scheme is estimated at £650, which will be spread over four years, and the current will be supplied by the Crigglestone Collieries, Ltd., if terms can be arranged.

Walsall.—The Electricity Committee has decided not to increase the existing charges for electricity. The Committee recommends that a fresh agreement be entered into with the Talbot-Stead Tube Co., Ltd., for the supply of electricity to their works and for an additional supply for a term of three years, commencing when the E.H.T. supply from the new station is available; also that a supply of energy be given to the Electrical Conduits, Ltd., and Rylands & Sons, Ltd., on terms and conditions approved by the Committee.

The new sub-station at Wolverhampton Street has been connected up with the generating station.

Warrington.—Year's Working.—In our last issue we gave the financial details of the year's working of the electricity undertaking to March 31st last. Mr. Mathias, the engineer, in his report mentions that 6,630,062 units were generated and 5,129,214 units sold (as compared with 4,274,897 units sold in 1914-15). Power units numbered 4,092,736, the remainder being for traction and lighting. The plant capacity was 5,150 KW., representing a capital outlay per KW. of £26; the maximum load was 2702 KW. The total working cost was ·782d. per unit, as compared with ·729d. in 1914-15, and despite the coal cost increasing from ·291d. to ·382d. per unit. An additional water-tube boiler, economiser, and coal-handling plant were being erected to meet the growing demands on the plant.

Wigan.—Delayed Extensions.—Alderman Grimshaw, speaking at the T.C. meeting, on the 7th inst., said the boilers for the electricity works were not expected to be erected in the specified time. So far as he could judge, they were likely to be held up by the L.G.B. for perhaps two years; and in view of that, he did not know that there was any limit to the time when the scheme recommended by the expert could be properly undertaken. A Sub-Committee had been appointed to enter into negotiations with an outside firm for the purpose of obtaining a supply, and these negotiations were not yet complete.

Wolverhampton.—Year's Working.—The accounts of the Corporation electricity undertaking for the year ended March 31st show a gross profit of £25,588, as compared with £28,631 in the previous year; the net profit was £1,856, as compared with £7,444, and has been transferred to the reserve fund. The total income shows an increase of £8,228. The number of units sold was 15,280,697, an increase of 2,154,126 over the previous year. During the year, 940 H.P. of additional motors were added, the total H.P. of motors connected being 10,686 H.P. The total cost of production per unit was ·651d., coal costing ·355d. The maximum load was 6,919 KW. and the connected load about 14,062 KW. The balance of the reserve fund stands at £13,217, the reduction of £4,587 on last year's figure being due to expenditure on account of mains, services, meters, &c., for which borrowing powers could not be obtained.

TRAMWAY and RAILWAY NOTES.

Accrington.—Accident.—On Friday last, a car left the track in the Blackburn Road, and ran into a loop line in Ellison Street, knocking down two children, who were injured.

Audenshaw.—Tramway Purchase.—The D.C. has decided to make application alone, or jointly with the other authorities interested, for an extension of time for the purchase of the Oldham, Ashton and Hyde Electric Tramways.

Birmingham.—Accident.—On Sunday night, two Corporation cars came into collision on a single track in Great Hampton Row; a great deal of glass was broken and many passengers shaken, but only five were treated at the hospital.

Bradford.—Electric Vehicles.—The L.G.B. has sanctioned the borrowing of £3,700 for the purchase of three electric tipping wagons for the electricity department.

Continental.—Norway.—A proposal for the electrification of the Drammen Railway, at a cost of approximately 21,369,500 kr., has been sanctioned by the Railway Committee of the Storthing.

Darlington.—Seats are being provided for women conductors, but the work has been delayed owing to the shortage of labour. The Committee is to consider the question of half fares for school children at its next meeting.

Doncaster.—Official consent has been given to the reconstruction of a portion of the Bentley tramways track by the T.C., and the work will be proceeded with as rapidly as possible.

Dover.—The T.C. has been granted by the B. of T. a further extension of time until November, 1916, for carrying out the Dover-St. Margaret's Light Railway Order.

Gateshead-on-Tyne.—Linking-up Proposal.—The Town Improvement Committee having considered the proposed tramway across the High Level Bridge to Newcastle-on-Tyne, reported against the proposal until the proposed Bill had been considered by the Gateshead Council.

Ilkeston.—Sale of Undertaking.—A special meeting of the T.C., by 14 votes to 3, approved the transfer of the Corporation tramways and electricity undertakings to the Derbyshire and Nottingham Tramways Co., Ltd., for the sum of £28,150.

Keighley.—Tramway Fares.—From October 1st the present halfpenny fares during the working week on the Corporation tramways are to be abolished, but there will be penny tickets entitling the passenger to travel any distance in one direction in a similar manner to what has been done at week-ends for some time past. Prepaid tickets, however, entitling the passenger to the privileges hitherto granted by the halfpenny tickets, are to be issued at the prices of five for 3d., 10 for 6d., or 20 for 1s. Arrangements are being made to supply quantities of these tickets to factories for sale at the works.

London.—L. & N.-W. Electrification.—It was recently announced that the North-Western electrical train service between Broad Street and Kew Bridge and Richmond would commence on Sunday, October 1st. The new trains will comprise first and third class only.

Newcastle-on-Tyne.—During a recent fog at Killingworth Crossing near Benton station, five horses strayed on to the N.-E. railway track, and coming into contact with the live rail, were killed.

Oldham.—Year's Working.—The annual report on the working of the Corporation tramways during the year ended March 31st last shows that the car-mileage, 1,983,607, was less than in any of the last three years, but the passengers carried, 23,477,066, constituted a record. The total receipts were £121.129 and the gross profit £39,538 (as compared with £28,730 in the previous year), while the net surplus was £4,112, which compares with a deficit of £5,218 in 1914-15, when the revenue fell off considerably and working expenses were abnormally large.

Plymouth.—The chairman, in commenting on the report of the Tramways Committee, said they had hoped that through running of the tramways, with a uniform penny fare, might have been effected by now, but owing to difficulty in obtaining materials, this would not be possible before the second week in October.

Rochdale.—Wind Screens, &c.—The tramway manager having reported on replies received from 71 municipalities owning tramways on the question of adopting wind screens or vestibules on the cars for the protection or motormen, the Tramways Committee has decided to invite a deputation of motormen to meet a Sub-Committee on the matter.

Various points in dispute in the draft lease of the Milnrow tramways are to be referred by the town clerk to the B. of T. for decision, at the request of the Milnrow D.C. It is proposed to purchase a sand spreader for attachment to the tramway watering-car.

Salford.—Increased Wages.—The proposed further war bonuses recommended by the Tramways Committee for payment to male tramway workers, were confirmed by the T.C. last week. The effect of the additions is that youths under 18 years will receive 2s. per week instead of 1s.; male employés over 18, who are not householders, will receive 3s. instead of 1s. 6d., and male householders, whose wages do not exceed 37s. 6d. per week, will receive 4s. 6d. per week, instead of 2s. 6d., as at present, and those receiving over 37s. 6d. will receive total wages, including war bonus, of 42s. per week, which is exclusive of the war bonus payments to skilled artisans. Councillor P. Hampson said it appeared to him to be a waste of public money to add to the already generous treatment of those who had gone to the Front.

Year's Working.—The annual report of Mr. G. W. Holford, general manager of the Corporation tramways, shows a gross profit on the year's working of £88,502, and a net profit of £18,475; this amount, with £3,526 taken from the depreciation and renewals fund, has been transferred to the relief of rates, being the £22,000 promised. The balance of the renewals fund now stands at £21,266. During the year 56,458,266 passengers were carried, being 2,114,358 more than in the previous year, and the total amount received in fares amounted to £270,350, an increase of £11,524; the miles run were 5,495,295, and the average earnings 11·8d. per car-mile; 41,163,325 penny tickets were sold being 75·362 per cent. of the total number issued, and £13,135 was paid in war allowances. The total route mileage worked is 42, rather more than half representing leased lines.

Stalybridge.—Accident.—A curious tramway accident occurred at Mottram, on Saturday last. In the absence of the driver, a Stalybridge car commenced to run down a hill at Mottram, and the few passengers on had an exciting time; they and the woman conductor jumped off before the car had gained a great speed, but one man was slightly injured. After running nearly a mile, the car crashed into a wall at Bower Fold.

Stockport.—Increased Wages.—The Employés and Car-Shed Sub-Committee has recommended the Tramways Committee to grant a gratuity of 5 per cent. on the wages to all employés of the department who have not participated in the gratuity granted by the Committee last November.

U.S.A.—A general strike of labour, involving 800,000 Trade Unionists, is threatened in New York City, in consequence of the failure of the employés of the tramway companies, who are on strike, to hold up local transit facilities.—*Daily Telegraph.*

Walsall.—The South Staffordshire Tramways (Lessee) Co., Ltd., and the Wolverhampton District Electric Tramways, Ltd., have agreed to pay the Corporation, as from July 12th last, an increased rate per car mile in respect of the excess mileage of the Corporation cars on the company's lines.

Whitefield.—Through Cars.—The clerk to the D.C. has been in communication with the Salford Corporation Tramways Committee on the subject of through cars between Manchester and Bury; and the Salford tramway manager has replied that his Committee does not consider the time opportune for any arrangement of the kind suggested, but will be prepared to reconsider the matter at the end of the war. He adds that the present service, with the restricted number of drivers, can only be maintained under very serious difficulties. The D.C. is apparently not satisfied with the promise that the matter will be reconsidered after the war, and has decided to reply to Salford that the matter is capable of arrangement between the Salford and Bury Corporations, and that the D.C. does not consider that any increase of drivers would be necessary.

Wigan.—Increased Wages.—The local branch of the Tramway Workers' Association has decided to accept the advance of ½d. per hour, provided that the increase be a distinct advance apart from the existing war bonus. The Special Committee on Wages has resolved that the increases of wages granted to the various classes of workmen recently be considered as an additional war bonus until the end of the war, and that the additional war bonus shall then become a permanent advance of wages.

TELEGRAPH and TELEPHONE NOTES.

New Fire Alarm System in New York.—Mr. Robert Adamson, fire commissioner of New York, has awarded six contracts for the construction of as many sections of this system, and active work on these is in progress. One contract has been completed. The system will cost $3,000,000.—*T. and T. Age.*

Brazil and Bolivia.—Radio-telegraphic communication has been experimentally established between Belem, Brazil, and Riberalta, Bolivia.—*T. and T. Age.*

Japan.—The third and final series of tests for trans-oceanic radio service between Honolulu and Japan has just been completed. Telegraphic reports indicate that these tests are by far the most successful of any so far made. Communication has been maintained in both directions, night and day.—*T. and T. Age.*

Wireless Station Dismantled.—The Allies have removed the appliances of the wireless station at Syra (Greece), and deposited them with the French Consulate there.

Wireless Telegraphy on Aeroplanes.—What is claimed to be a record in wireless telegraphy from aeroplanes was recently established by Captain Culver, of the U.S. Army Aviation Corps. During a flight from San Diego to Santa Monica, 114 miles away, he is stated to have kept in touch with his station by sending wireless messages every three minutes. The power for the transmission set is derived from a generator placed on the lower wing section of the aeroplane, and driven by a two-bladed propeller. Aerial wires are suspended from the "fuselage" of the machine, with an insulated counterpoise hung from the wings to the tail of the aeroplane. The complete transmission set is stated to weigh less than 40 lb.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Sydney.—September 20th. N.S.W. Government Railways. One 50-ton electrically-operated overhead travelling crane for Zara Street power house, Newcastle.—October 11th. One motor-driven air compressor for Zara Street power house. Electrical Engineer, 61, Hunter Street.

January 22nd, 1917. Electrical plant for the Castlereagh Street sub-station, for the Municipal Council. Specification from E.L. Department, Town Hall.—*Australian Mining Standard.*

Adelaide.—September 27th. Deputy P.M.G. Telephones, telephone material, instruments and parts. Schedule Nos. 429 to 437.*

Perth.—October 4th. Deputy P.M.G. Telegraph and telephone measuring instruments and parts. Schedule 501 W.A.*

Melbourne.—September 29th. City Council. Insulated and H.D. copper cables. See "Official Notices" September 8th.

October 17th. For the Deputy P.M.G. (1) Sleeves and tapes (Sched. No. 1,355), and (2) 3,100 stay-rods, with low tighteners (Sched. No. 1,359).*

October 18th. Victorian Government Railways. Electric time releasing mechanisms for automatic signalling (Cont. No. 30,343).* November 1st. 50,000 yellow flame arc carbons.*

December 11th. City Council. Supply and erection of coal transporter plant. See "Official Notices" to-day.

South Australia.—November 15th. P.M.G.'s Department. Automatic switchboards and all associated apparatus, for telephone exchanges, Brighton and Glenelg.

Burnley.—September 19th. The B. of G. invites tenders for electrical goods. Tender forms from J. S. Horn, Clerk.

Edmonton.—September 20th. Electric lamps for six months. Mr. F. Shelton, Clerk, B. of G., Lower Tottenham.

Keighley. — September 21st. Corporation Electricity Department. Best slack and small slack coal, about 12,000 tons. Prices are to be based on a six-monthly and twelve-monthly period. Mr. H. Webber, Borough Electrical Engineer.

Liverpool. — September 18th. Electrical supplies for three months, for Toxteth Park B. of G. Mr. R. A. James, Clerk, 15, High Park Street.

London.—Supply of electric light fittings for Australia House, Kingsway, W.C. Particulars from Mr. H. H. Turner, 48, Broadway, Westminster, S.W.

CITY OF WESTMINSTER UNION.—September 20th. B. of G. Six months' supply of electric lamps, fittings, &c. Mr. W. J. Lickley, Clerk, Gardens Offices, Princes Row, Buckingham Palace Road, S.W.

KENSINGTON.—September 20th. B. of G. Six months' supply of electric fittings and electric lamps. Mr. W. R. Stephens, Clerk, Guardians' Offices, Martoes Road.

Manchester.—September 22nd. Electricity Committee. Fuse boxes for 12 months. Mr. F. E. Hughes, Secretary, Electricity Department, Town Hall.

New Zealand.—WELLINGTON. October 11th. Public Service Stores Tender Board. 1,000 magneto extension bells, 1,000 ohms.*

Warrington.—September 20th. Electrical goods (not of German or Austrian origin) for the B. of G. for six months. Mr. A. Bottomley, Clerk, Bewsey Chambers.

Specifications for the items marked * can be seen at the Board of Trade Commercial Intelligence Branch in London.

CLOSED.

Australia.—The Hawthorn Tramway Trust, Victoria, has accepted the following tenders :—

15 car-bodies.—Duncan & Fraser.
Cross-overs.—Horrocks, Roxburgh Pty., Ltd.
Motor equipment.—Aust. General Electric Co. and British Westinghouse Electric & Mfg. Co.

N.S.W. Public Works Department :—

Pumping machinery for Wagga Wagga water supply, with special electric type engine, £6,997.—A. Leplastrier & Co. —*Tenders.*

Blackpool.—The borough electrical engineer has reported to the Electricity Committee that the B.T.H. Co. have withdrawn their tender for a new 1,500-KW. turbo-alternator.

Wakefield.—Council Electricity Works :—

Sturtevant Co.—Steel chimney, fan, motor, &c., £870.
E. Green & Son, Ltd.—Economiser and accessories, £2,675.

FORTHCOMING EVENTS.

Institute of Metals.—Wednesday, September 20th. At 4 p.m. At Burlington House, Piccadilly, W. Annual autumn meeting.

Iron and Steel Institute.—Thursday and Friday, September 21st and 22nd. At 10.30 a.m. At the Institution of Civil Engineers, Great George Street, S.W. Annual meeting.

NOTES.

Foreign Trade.—THE AUGUST FIGURES.—The official returns of imports and exports during last month contain the following electrical and machinery figures :—

	August, 1916.	*Inc. or dec.*	*Eight months*, 1916. *Inc. or dec.*
IMPORTS :—			
Electrical goods, &c.	£109,455	+ £4,152	+ £399,455
Machinery	618,435	− 175,468	− 366,789
EXPORTS :—			
Electrical goods ...	409,509	+ 150,379	+ 789,420
Machinery	1,933,710	+ 449,776	+ 100,863

A High-Speed Squirrel-Cage Winding.—Referring to the high-speed squirrel-cage winding described on page 263 of our issue of September 8th, in which copper strips are split and expanded into loops to form rotor conductors, Mr. W. C. Kennett, of Eltham, writes to point out that although this method may be new to Americans, it is quite an old idea in this country, having been used many years ago by Messrs. Johnson & Phillips, Ltd., and no doubt by others.

Scientific Research.—Mr. Arthur Henderson has been appointed a member of the Committee of the Privy Council for the purpose of the organisation and development of scientific and industrial research.

Electro-deposition of Zinc.—A correspondent asks for information as to the best method of depositing a coating of pure zinc on metal sheets, the chemicals used for the electrolyte, and the voltage and current density required.

Inquiry.—A correspondent asks for information regarding an electric burner for removing old paint and varish from raliway rolling stock.

C.M.A. Standard Specification.—A slight alteration has been made in the specification of C.M.A. flexible cords. These are now made to comply with the standards for vulcanised rubber flexibles laid down in the latest edition of the I.E.E. Wiring Rules, revised March, 1916. The only alteration is that the insulation resistance is 1,250 megohms per mile, instead of 600.

Fatalities.—An inquiry was held, on the 9th inst., by Deputy Coroner Shepherd, at Hebburn-on-Tyne, into the circumstances attending the death of George Dickson, who was killed by a shock from an electric lamp standard. Owing to pressure on our space, we are obliged to defer the report to our next issue.

According to a Glasgow paper, Hugh M'Ginlay (28), Glasgow, was instantaneously killed in a Cardonald factory, on September 7th. He accidentally put one of his feet on a rail charged with electricity, and was unable to release himself until the current was switched off. He then fell 30 ft., and alighted on the top of some machinery. He died from fracture of the skull.

The Trade Union Congress.—The Congress held last week did not fail to present, as we anticipated, some remarkable features. Of these, one of the most striking was the adoption, by a majority of 7 to 2, of a resolution advocating the restriction or prevention of the importation of cheap manufactured goods which have been produced at lower rates of wages, or under worse labour conditions, than those prevailing in this country, which has been generally regarded as a declaration of the abandonment of the traditional Trade Union policy of free imports, and certainly should strengthen the hands of the Government in devising measures to shut out enemy goods from British markets. Other clauses of this resolution urged the necessity of educational reform, improvement in working conditions and in housing accommodation, and the abolition of any monopoly of natural resources which provides income without service.

An important item in the proceedings was a resolution demanding the restoration of the *status quo ante bellum* when peace is declared, in accordance with the firm promises of the Government. That this bond must be redeemed without reserve will be admitted by all parties, but we very much doubt whether the workers, on reflection, will desire it, for it cuts both ways, and more to the disadvantage of the workers than of any other party in the State. Restriction of output inevitably implies low wages—otherwise successful competition after the war will be impossible; the workers have experienced the benefits of high wages, which have added to their comfort and raised the standard of living even in a period of exceptionally high prices—is it conceivable that they will wish to return to the former conditions? By maintaining a high output, they can retain their high wages, and we are confident that, when confronted with the alternatives, they will have no hesitation in making the choice. But a concurrent reorganisation of industry is essential, and we trust that some means will be found whereby masters and men can come together and amicably resolve the numerous problems with which they are confronted.

Overhead Lines and the Board of Trade.—We are informed by the Board of Trade that a considerable number of applications have been made for the consent of the Department to the erection of temporary overhead lines for the transmission of electrical energy. Attention is drawn to the accompanying memorandum relating to the particulars required by the Department in connection with such applications :—

"Every application for the consent of the Board of Trade to the placing of electric lines above ground should be accompanied by the following particulars : –

"1. Where the undertakers are a company, or a local authority supplying outside their own area, evidence of consent of the local authority* for the district.

"* The local authorities are :—

"(*a*) In England and Ireland :—Borough Councils, Urban District Councils, Rural District Councils.

"(*b*) In Scotland :—Police Commissioners, Gas Commissioners, Town Councils, County Councils.

"2. A statement showing commercial or other considerations why underground cables should not be used.

"3. A brief description of the proposed system, whether by continuous or by alternating current; the working voltage; the kind of wire, whether copper or aluminium; whether solid or stranded; the total sectional area; tensile strength and elongation; average and maximum length of span; minimum height of wires from the ground; name or description of automatic protective device, if any.

"4. A statement whether the supply is to form (1) an extension of an existing system of underground cables, or (2) of an existing traction system, or (3) an independent system.

"5. An ordnance map on a scale of 6 in. to the mile, showing the proposed route of the overhead lines and any existing overhead lines. The sheets of these maps must be fastened together.

"6. In the case of high and extra high pressure, plans of construction of poles, &c., on a scale of about 1 in. to the ft., or a reference to previously deposited plans where these are identical with the proposed work.

"NOTES.—Codes of Regulations have been made (1) for overhead lines for low-pressure and medium-pressure continuous-current supply, and for low-pressure alternating current supply, and (2) for pressure exceeding low or medium pressure continuous-current and low-pressure alternating current. Regulations will be made for each case separately, following these codes unless special alterations are sanctioned.

"Attention is called to the necessity for obtaining the approval by the Postmaster-General of plans and works under Sec. 14 of the Schedule to the Electric Lighting (Clauses) Act, 1899."

The A.S.E. Secretaryship.—As a result of the ballot of members of the Amalgamated Society of Engineers, Mr. Robert Young has been appointed secretary. He polled 4,196 votes more than Mr. Tom Mann. Mr. W. Glennie is to be assistant general secretary.

Appointments Vacant.—Assistant master in electrical engineering for the Regent Street, Polytechnic; working inspector, for temporary electrical installations in the Northern Command; assistant electrical engineer (35s.) for the Ascot Electricity Works; shift engineer (45s.), fitter driver (40s.) and sub-station attendants (30s. to 35s.) for the Rhondda Tramway Electricity Works. See our advertisement pages to-day.

Hard Paste Porcelain.—At the British Association meetings held at Newcastle-upon-Tyne last week, an extremely interesting exhibit was shown in the chemistry laboratory comprising a display, in white hard paste porcelain, of various pieces used in the electrical trade.

These articles were manufactured by Messrs. Taylor, Tunnicliff and Co., of Eastwood, Hanley, in conjunction with Mr. C. H. Thompson, F.C.S., of Amblecote, who have been generally congratulated upon successfully carrying out an important achievement in a department that has always been considered a Continental monopoly. The actual samples exhibited will shortly be available for inspection by those interested, at Messrs. Taylor, Tunnicliff's London office at 23, Holborn Viaduct, and the company's London director, Mr. M. J. Dark, will be pleased to give every facility for such inspection. This exhibition is the more interesting in view of the fact that, as mentioned on p. 291 of this issue, the Government have allotted a considerable sum of money to the governing body of the Pottery and Mining Schools, Stoke-on-Trent, for the establishment of research work in this particular direction.

Engineering Trade Policy.—We are informed that in view of the national prominence of the engineering industry, the Lord Mayor is convening a public meeting at the Mansion House, at 3 p.m. on Wednesday next, September 20th, to discuss future trade policy, with special reference to the economic utilisation of the engineering works of the nation, which have been so largely expanded in capacity and equipment during the past two years. The organisation of the meeting is being undertaken by the British Electrical and Allied Manufacturers' Association, with the support of the British Engineers' Association, the British Empire Producers' Organisation, and the Engineering and Electrical Sections of the London Chamber of Commerce. Applications for tickets of admission should be sent to Mr. T. C. Elder, Organising Secretary for the Meeting, B.E.A.M.A. Offices, 36, Kingsway, London, W.C., or to the Secretaries of any of the above organisations.

Volunteer Notes.—First London Engineer Volunteers.—Headquarters, Chester House, Eccleston Place, S.W.—Orders for the week by Lieut.-Col. C. B. Clay, V.D., Commanding.

Monday, September 18th.—Technical for Platoon No. 9, at Regency Street. Squad and Platoon Drill, Platoon No. 10. Signalling Class. Recruits' Drill, 6.25—8.25.

Tuesday, September 19th.—Range Practice.

Wednesday, September 20th.—Lecture, 7.15. Lecture, W. Eyles, Esq. (late R.E.), 7.15, "Demolitions." Platoon Drill, Platoon No. 1. Range Practice.

Thursday, September 21st.—Instruction Class, 5.45. Platoon Drill, Platoon No. 5. Range Practice.

Friday, September 22nd.—Technical for Platoon No. 10, Regency Street. Squad and Platoon Drill No. 9. Signalling Class. Recruits' Drill, 6.25—8.25.

Saturday, September 23rd.—Instruction Class, 2.30. Company Commander Fleming.

Sunday, September 24th.—Entrenching.—Parade Victoria Station (S.E. & C. Railway). Booking-office, 8.45 a.m.

Macleod Yearsley, *Adjutant.*

3rd Batt. (Old Boys') County of London Volunteer Regiment.—Battalion Orders by Major R. J. C. Eastwood (Commandant), Thursday, September 14th, 1916:—

Week-end Parade.—Saturday.—Parade at Liverpool Street Station (Low-Level entrance, G.E.R.), at 8.40 a.m., for Entrenching duties. Those who cannot take the early train will parade at 1.20 p.m.

Sunday.—Parade at Liverpool Street Station, 9.30 a.m., for Entrenching duties.

Route March.—It is intended to hold a Route March on Saturday, 23rd inst.

G. H. F. Duncan, *Acting Adjutant.*

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—The staff of the Heywood Corporation electricity works have presented Mr. R. B. Leach, chief engineer and manager, with a smoking outfit and testimonial on the occasion of his leaving to take up his duties as borough electrical engineer at Loughborough.

The South Shields T.C. has increased the salary of the borough electrical engineer (Mr. H. S. Ellis) from £450 to £500 per annum. Mr. Ellis applied for an advance of £100.

General.—Upon the occasion of his marriage, Mr. Harold Wright was last week presented by the office staff of the British Insulated & Helsby Cables, Ltd., with a set of cutlery and spoons.

Lieutenant George Edward Preece, Royal Engineers, who was married at Bradford, on Friday, to Miss Dorothy Mary Beresford Mitchell, daughter of Mr. and Mrs. J. G. Mitchell, of Nab Wood, is by profession an electrical and mining engineer. He came home on short leave from the Front.

At Stoke-on-Trent Parish Church, on September 5th, the marriage took place of Mr. Frank Hatch, assistant general manager of the Potteries Electric Traction Co., and Miss Clara Booth, of Stoke.

Mr. E. J. Nally, vice-president and general manager of the Marconi Wireless Telegraph Co. of America, sailed for England on September 1st on business.

Mr. H. W. Leonard, who for the past six years has held an important position in the G.E.C. publicity department, has recently joined up for service with the London Electrical Engineers.

Roll of Honour.—Rifleman Joseph Corfield, of the Rifle Brigade, whose death in action is reported, had twice previously been wounded. He was formerly employed in the electrical department of Messrs. A. Knowles & Sons, colliery proprietors, Pendleton, and was 19 years of age.

Private W. Clems, of the South Lancs. Regiment, who is in hospital at Birmingham, suffering from wounds and shell shock, was employed before the war in the electricity department at the works of Messrs. Joseph Crosfield & Sons, Ltd., soap manufacturers, Warrington.

Lance-Corporal Leonard P. Beech, of the King's (Liverpool) Regiment, formerly on the office staff of the British Insulated & Helsby Cables, Ltd., has been wounded, as has also Private Arthur Hulme, of the Cheshire Regiment, employed by the same company.

Sapper C. E. Whittle, Royal Engineers, is in hospital in Aberdeen suffering from wounds. Prior to enlisting he worked in the Bolton Corporation electrical fittings department.

Trooper B. Browning, Royal East Kent Mounted Rifles, who was on the Faversham Corporation electricity staff, is in hospital at Addington Park, Croydon.

Sergeant Victor Johnson, Queen's Royal West Surrey Regiment, who enlisted whilst a wireman with the Godalming Electricity Co., has gained the Military Medal for gallant conduct in rescuing an officer from between the British and German lines.

Private Charles Little, King's (Liverpool) Regiment, who belongs to Douglas (I.O.M.), and left a position as electrical engineer in America to join the Forces, is reported from France to be missing.

Lance-Corporal E. G. Price, Sutton, who has fallen in action in France, was, on his enlistment, engaged with the South Metropolitan Electric Tramways & Lighting Co.

The Military Medal has been granted to Corporal J. W. Richardson, West Yorkshire Regiment, for gallant service in the field. He was engaged in the offices of the York municipal electricity undertaking.

Private Thomas Bennett, Loyal North Lancashire Regiment, reported from France to be missing since July 23rd last, enlisted whilst with Messrs. Dick, Kerr & Co., Ltd., of Preston.

Private M. Corrigan, of the Manchester Regiment, formerly employed at the British Westinghouse Works, Trafford Park, is missing.

Private S. Roy Holmes, West Yorkshire Regiment, an apprentice with Mr. Reginald Falshaw, electrical engineer, of Harrogate, who enlisted at the outbreak of war, has died of wounds received in action. He was 22 years of age.

We regret to note that Thomas Francis Phillips, Mortar Battery, younger son of Mr. and Mrs. C. J. Phillips, of Ashcroft, Orpington, was killed in action on September 2nd. We tender to Mr. C. J. Phillips, who was the provincial superintendent of the Southern Provinces of the late National Telephone Co., our deep sympathy in his bereavement.

Private Ernest Job Farnsworth, Suffolk Regiment, who has died of wounds received in action in France, enlisted whilst with Messrs. Siemens, Stafford.

Private Ernest Williams, North Staffs. Regiment, who enlisted at the outbreak of war whilst with Messrs. Siemens, Stafford, and who has been missing since October 13th, 1915, is now presumed to have fallen in action on that date.

Acting Quartermaster-Sergeant Geo. Kendall, Royal Field Artillery, wounded in action in France, was formerly manager of the Reading Corporation tramways parcels office.

Private R. C. Whewell, of the Royal Scots, has been awarded the D.C.M. for gallant conduct in France. He was employed at the L. & Y. Railway Co.'s electrical power station.

Acting-Corporal W. Sanders, Rifle Brigade, officially reported killed, was employed by the Lancashire Dynamo and Motor Co.

Private Fred Looney, King's (Liverpool) Regiment, killed in action, was employed at the British Westinghouse Co.'s works.

Lance-Corporal Frank Cressall, Royal Warwickshire Regiment, was killed in action on the 4th inst., aged 24. Mr. Cressall was in the employment of Messrs. Mavor & Coulson, Ltd., at the time of the outbreak of war, and it was arranged about that time that he should join the Cressall Manufacturing Co., of Birmingham, as junior partner, but instead of so doing he joined the Colours soon after leaving Messrs. Mavor & Coulson, Ltd. Prior to being with that firm he had been with the Electrical Apparatus Co., Ltd., London, the Electric & Ordnance Accessories Co., Ltd., Aston, and the General Electric Co., Ltd., Witton, where he commenced his training.

Captain James Hendry, of the Royal Scots, an electrical engineer who served at Glasgow and Pittsburg, and was later a consulting engineer at Rochdale, has died of wounds received in action.

Bombardier G. A. Bailey, Royal Field Artillery, formerly an electrician on the engineer's staff at the Liverpool Post Office, has been killed, aged 25 years.

Private Cecil Dodd, of the Manchester Regiment, killed in action, was a former employé of the British Westinghouse Co., Trafford Park; and Private Harry Crossley, of the Manchester Regiment, another employé of the same firm, has been wounded while fetching stretcher-bearers to assist a wounded comrade.

We regret to learn that the younger son of Mr. James McMillan (James McMillan & Co., formerly the Ericsson Bell Telephone Co.) was killed in action in France on September 2nd. He joined the London Rifle Brigade, but was transferred to the London Regiment. He was 19 years of age, and had only been in France three weeks. He was educated at Highfield School and Hanover.

Mr. R. M. Bishop, formerly associated with the accounts department staff of Siemens Bros. Dynamo Works, Ltd., at Upper Thames Street, E.C., has been promoted while on active service to the rank of sergeant. He was also awarded the Military Service Medal for conspicuous bravery at Pozieres.

Private J. W. Cotton, of the King's (Liverpool) Regiment, whose death from wounds is announced, was employed by Messrs. Ferranti, Ltd.

Private Walter Offielld, of the Scottish Borderers, previously reported missing, and now officially reported killed, was employed prior to his enlistment at the British Westinghouse Works, Trafford Park. He was 19. Another employé of the British Westingohuse, Lance-Corporal E. W. Icke, aged 22, is now reported killed, after having been posted as missing. Private J. Wyllie, aged 26, another former employé of the firm, has been killed while acting as stretcher-bearer. He had served at Gallipoli and in France.

Private Ernest Land, of the Cheshire Regiment, now reported killed after having been previously reported missing, was 27 years of age, and was formerly employed at the British Westinghouse Works, Trafford Park. Sapper P. Harris, of the Royal Engineers, also formerly of the Westinghouse Works, has been killed, aged 22 years.

Private L. Steele, of Crewe, formerly employed in the electric shop at Crewe Railway Works, has been wounded.

Private Douglas Gibson, of the Royal Welsh Fusiliers, who has been wounded, and is now in hospital in France, was employed prior to the war in the electricity dapartment at Blackpool Tower.

Obituary.—Sir James Sivewright, C.M.G.—We regret to learn that Sir James Sivewright passed away on September 10th, at the age of 68 years. He was born at Fochabers, Scotland, and was educated in that country, taking a degree of M.A. at the Aberdeen University. Originally it was intended that he should enter the Government Telegraph Service in India, and, having passed the examination for this purpose, he underwent practical training for the Indian service under the late Sir W. H. Preece, at the Hartley Institution, Southampton. At that time Sir W. H. Preece (then Mr. Preece) was telegraph divisional engineer of the southern district of England, with headquarters at Southampton. At the organisation which followed on the transfer of the telegraph systems of the United Kingdom to the State (under Post Office control), Mr. Sivewright was offered by Mr. Preece the position of engineer-superintendent of that portion of the southern division which had its chief office at Southampton (other superintendents being located at Exeter and Bristol). This position of superintendent was accepted, and was held by Mr. Sivewright for a number of years, until, at the request of the South African Government, an expert was asked for for the purpose of reporting upon the position of the whole telegraph system in South Africa; on the recommendation of Mr. Preece, Mr. Sivewright was nominated for this work. As a result of the visit to South Africa, Mr. Sivewright became chief of telegraphs in that country, and under his administration great improvements were made in the service; for his services in this connection Mr. Sivewright was given the honour of C.M.G. Being brought into close contact with the various South African governmental and industrial authorities, Mr. Sivewright's abilities resulted in his being offered a seat in the Government Cabinet, whilst his commercial abilities enabled him to make a considerable fortune. During the Boer War he offered his large estate for the purposes of a home for the British wounded. On the conclusion of the war he returned to England, and settled down in his native Scotland, on an estate which he had acquired. Sir James will perhaps be best known as the joint author with Sir W. H. Preece of the well-known book on "Telegraphy," published by Longmans, a book which has acquired a name as a standard work, and which has gone through very numerous editions. He was secretary of the Society of Telegraph Engineers (now the Institution of Electrical Engineers) for just over a year (1876-77). Sir James, who had been ill for some time, passed away at a nursing home in Shropshire

Mr. Samuel Charles Sparks.—Mr. S. C. Sparks, who has died at Leeds, was formerly the telegraph superintendent in the city. He was 73 years of age.

CITY NOTES.

The Metropolitan Electric Supply Co., Ltd.

An extraordinary general meeting of the Metropolitan Electric Supply Co., Ltd., will be held on Thursday, September 28th, at 2.30 p.m., at Salisbury House, to consider the report of the committee appointed at the ordinary general meeting held on March 22nd, and, if approved, to pass the following resolutions:—

1. That the report dated August 16th, 1916, of the committee appointed by the general meeting held on March 22nd last, and issued to the shareholders with the notice convening this meeting be, and the same is, hereby approved and adopted, and that the arrangements thereby recommended be carried into effect.

2. That Mr. Andrew Wilson Tait, Mr. George Balfour, and Mr. George Verity who are recommended by the committee and by the board for election be, and they are, hereby elected directors of the company.

3. That the committee be directed to place at the disposal of the board the reports of the experts employed by them, together with all such information as the board may consider to be of service to the company.

At the conclusion of the business of the extraordinary meeting the consideration of the business left unfinished at the ordinary general meeting held on March 22nd will be resumed, and Mr. Geoffrey Blackwell and the Rt. Hon. F. Leverton Harris, M.P., two of the directors retiring by rotation, will be proposed for re-election, Mr. G. A. Moncrieff, the third director retiring by rotation, having resigned his seat at the board.

The following is the report of the shareholders' committee referred to above:—

We have proceeded upon the reference made at the general meeting of the company held on March 22nd, and have examined into the affairs of the company and the past and future conduct of the business.

We have held upwards of 30 meetings and have interviewed all the present directors, except Mr. Moncrieff, also the three directors who have retired, and Mr. Highfield and the company's other chief officials.

We have also had placed before us numerous reports and minutes, and in particular the reports recently prepared at the instance of the board by Sir John Snell, the well-known consulting electrical engineer, and by Messrs. Jackson, Pixley and Co., chartered accountants.

We instructed Mr. Charles P. Sparks, president of the Institution of Electrical Engineers, and Mr. David H. Allen, of Messrs. Harris, Allen & Co., chartered accountants, to assist us, and they have acted as our assessors and have made their written reports to us. We are much indebted to them and also to Mr. Furnival Jones, who has acted as our secretary, for the valuable assistance they have rendered us throughout this inquiry.

Having concluded our inquiry, and having carefully considered the evidence, it seemed to us desirable that if possible some arrangement with the present board should be come to, so as to avoid the necessity of publishing a report dealing with various matters intimately connected with the company's business and affairs, which if made public might seriously interfere with the trading and future prosperity of the company.

With this end in view we approached the directors, and are pleased to report that an arrangement has been arrived at, which we believe will be satisfactory to all sections of shareholders and ensure harmony on the board.

Mr. Harrison Cripps has placed his resignation of the chairmanship in the hands of the board. Mr. Andrew Wilson Tait, a member of the firm of Messrs. George A. Touche & Co., and Mr. George Balfour, of Messrs. Balfour, Beatty & Co., Ltd., and Mr. George Verity, chairman of Veritys , Ltd., whom we have suggested as suitable persons (the first-named as chairman) will be added to the board, the number of which is for the present, at all events, to be limited to seven. The board as reconstituted will be as follows:— Mr. Andrew Wilson Tait (chairman), Mr. George Balfour, Mr. Geoffrey Blackwell, Mr. W. Harrison Cripps, Rt. Hon. F. Leverton Harris, M.P., Mr. J. Carr Saunders, and Mr. George Verity.

In view of this arrangement we feel that no useful purpose can be served by referring to the matters of controversy raised at the last meeting of the shareholders. At the same time, we feel it right to express regret that personal imputations should have been made on that occasion which in our opinion were not justified.

We also wish to record our opinion, that the services of Mr. Highfield, as engineer, have been most valuable to the company and should be retained.

We would further add that in our opinion the board should direct their special attention to the energetic development of business in the western area.

Under all the circumstances we confidently recommend the shareholders to accept the arrangement indicated above, and if desired we shall be prepared to place before the new board such information as we have acquired, including the reports which have been put before us, and to give to the company any other assistance in our power.

The report is signed by the members of the shareholders'

committee, namely, Messrs. Roger Gregory (chairman), R. Melvill Beachcroft, and W. S. Poole.

Victoria Falls and Transvaal Power Co., Ltd. The report of the directors for the year ended December 31st, 1915, states that the issued share capital amounted to £3,000,000 and the debenture capital to £4,465,620, a further £78,300 of the 5½ per cent. second mortgage debentures having been purchased during the year 1915. The year's business has resulted in a profit of £729,662, which, with the £106,447 at the credit of profit and loss account as at December 31st, 1914, remaining after payment of the dividends on January 6th and June 21st, 1915, and an adjustment of income-tax, makes a gross total of £845,649. After providing for interest on debentures for the year, 1915, amounting to £232,557, and for depreciation, income-tax, excess profits duty, &c., amounting to £274,025, the balance remaining is £339,068. A dividend was declared last December of 6 per cent. per annum, less income-tax, for the ten months ended February 28th, 1915, on the preference shares, and a further dividend on the preference shares also of 6 per cent., less income-tax, for the ten months ended December 31st, 1915, was declared in May, 1916. These dividends were paid in January and June, 1916, respectively, and absorbed £177,499, leaving £161,568 to be carried forward to the current year's accounts. Since the last report, the second large turbo-generator at the Brakpan power station has been brought into commission, and the whole of the plant for all the power stations of the combined undertakings is now installed. Sir Henry Birchenough, K.C.M.G., and Sir Charles Metcalfe, Bart., retire, and, being eligible, submit themselves for re-election. Since the last meeting Mr. Luebeck has resigned his seat on the board. General meeting: September 22nd.

Manaos Tramways and Light Co. The report for the year ended April 30th states that the adverse influences which caused a decrease in the earnings during the preceding year, have still been operative, although to a somewhat lesser extent, and indications of better trading conditions in the Amazon valley are not lacking. Brazilian exchange declined slightly in the course of the year, but is showing signs of greater steadiness during the last few months. This depreciation of currency has resulted in a loss of £13,093 on remittances from Manaos during the year. The gross earnings were £110,524, as compared with £110,420, and operating expenses £76,172, against £82,240; as a result the net operating revenue carried to profit and loss account increased from £26,180 to £34,352. After providing for debenture interest, sinking fund, interest on loan, London office expenses, sundry charges and the loss in exchange already referred to, £1,661 is carried to the balance sheet. The indebtedness of the State Government has been slightly reduced, and every possible effort is being made with a view to avoiding a further accumulation of unpaid bills for public lighting. Meeting: 15th inst.—*Financial Times.*

Canadian General Electric Co.—The directors have declared a quarterly dividend of 1¾ per cent. for the three months to September 30th, being at the rate of 7 per cent. per annum on the common stock.

Manila Electric Railroad & Lighting Corporation.—The directors have declared a dividend of 1½ per cent. for the quarter to September 30th on the common capital stock.

Globe Telegraph & Trust Co., Ltd.—The directors have declared a quarterly interim dividend of 3s. per share on the preferred shares, less income-tax, and 2s. per share on the ordinary shares, income-tax having already been deducted.

STOCKS AND SHARES.

TUESDAY EVENING.

Consols rose to 60¼, producing a still more cheerful effect upon investment markets as a whole. The full extent of the rise was not held, but the price of the Funds kept steadily over 60. Except for Home Railway stocks, the demand is noticeably urgent for good securities of all kinds. Why Home Railway stocks should be dull it is difficult to say, except from the aspect of the labour world. There is no doubt but that apprehensions of industrial trouble after the war are checking purchases in this market. Meanwhile, in spite of hints of similar difficulties in other trades, shares in domestic industrial companies are increasing in value every day. The iron, coal, and steel group stands out with prominent strength.

The Mexican situation is declared to be better, in consequence of the reported withdrawal of 40,000 United States troops from the Mexican frontier and the further advances of General Carranza to President Wilson in the interests of peace. Nevertheless, definite news is so difficult to obtain that prices of Mexican issues have scarcely moved. Dealers in the various markets report that holders will not sell, but at the same time, there are only a few buyers. Therefore prices keep firm, and Mexico Tramway bonds of both classes have risen a point. The British Columbia group is exceptionally good, the preferred and deferred drawing together at 54½, the rises being 1½ and 3½ respectively. The preference is up at 72; and although the debentures have not changed quotably, they are extremely difficult to get hold of.

Anglo-Argentine Tramways remain a weak spot. Besides the recent commentaries on the perplexities that are troubling the Argentine Republic as a whole, the Railway and Tramways Companies are known to be handicapped by the high price of coal and by the difficulty of obtaining supplies. The Anglo-Argentine Tramways deferred the last dividend on its second preference shares, and there is just the fear lest the first preference may also have to go without their dividend in respect of the current six months.

The troubles of the Argentine Republic are only temporary, of course; and the purchases of various Argentine stocks which the Americans were making some few months ago point to the faith that United States investors have in the country. Evidently there is a difficult furrow to be got through before prosperity re-emerges, and some talk as if only the end of the war, bringing with it a release of shipping facilities, is likely to mend matters permanently in the country.

Brazilian Tractions are week at 60¾. Digestion of the report has not brought in buyers; and during the past week or so the milreis has shown signs of going back. Heaviness spreads over most stocks and shares connected with Brazil, the Railway shares going back with the rest. At their present price, Brazil Tractions show a fall of ¾ on the week.

Canadian General Electrics dipped to 120, but recovered to 123. Pennsylvania Waters are a good spot at 82, this being a rise of 2 points this week. Consolidated Electric Power of Baltimore was quoted ex dividend yesterday (Monday), the common and preferred being now 115 and 118 respectively. The company's 5 per cent. debenture stock has not yet appeared in any of the Treasury lists as being required by the Government for deposit under Scheme "B." The mild gamble in Cordoba Light, Power & Traction ordinary has given way to quietude, and the price of the shares is about 4s. 9d., the 5 per cent. debenture being quoted 75-80, but not having changed hands since February last.

The list of domestic electricity shares is very firm. City preference are ½ up at 10¾. St. James's rose to 6¾. Charing Cross ordinary and preference have both arrived at 3 9/16, showing a loss of 1/16 in the former case and a gain of the same amount in the latter. There is a fair demand for electricity supply shares, and, as we have pointed out before, the buyers are disregarding the war period. South Metropolitan ordinary are steady at 19s. A little business in Urban Electrics resulted in the preference easing off to 2⅞. The ordinary changed hands a day or two ago at 4s., and the last price marked in the debenture stock is 73.

The report of the Shareholders' Committee of the Metropolitan Electric Supply Co. has now been published to the shareholders. In brief, the report suggests a slight re-arrangement of the board, and sets out the names of seven gentlemen recommended as suitable. The committee breathe conciliation and peace. They deprecate publication of any report dealing with matters intimately connected with the company's business and affairs which, if made public, might seriously interfere with its future prosperity; and they believe that the arrangement with the directors will be satisfactory to all sections of shareholders, and will ensure harmony on the board. An extraordinary general meeting is therefore convened to take place on Thursday fortnight, September 28th, and there seems to be no reason why this should not be an entirely amicable gathering. The great majority of shareholders will certainly be only too glad to feel that the company is once more proceeding harmoniously with its work, and that personal considerations no longer embarrass the proper business of the concern.

London United Tramways debenture stock has improved to 48. Potteries preference advanced to 11s., and the ordinary are better at 6s. 6d. Victoria Falls & Power preference jumped sharply to 19s. 9d. on the publication of the annual report, and the ordinary have hardened to 9s. 3d., the latter being now well within sight of a dividend. In the course of another year, it may be reasonably hoped that the ordinary will receive a modest distribution.

Telegraph stocks are steady on the whole, though the Eastern group is a little easier, Eastern ordinary receding 2 points and "China" shares falling ½. Marconis remain quiet. The recent flutter of excitement in Americans has subsided, though the price keeps firm at 19s. 6d.; while Canadians, which participated but little in the rise in Americans, hold to half-a-guinea.

The principal fall in Home Railway stocks is one of 3½ points in Central London non-assented ordinary, this dropping to 44½ on a little stock coming to market. The assented is also a point down at 73. Metropolitans weakened to 25, and Underground Electrics are also a trifle easier, the dullness being due to the prevailing sentiment in the market as a whole.

Amongst industrials, Babcock & Wilcox, after their recent strength, have gone back a trifle to 3 1/16, and Castner-Kellners fell ½ to 3¾. British Aluminium at 26s. 3d. are the pence higher, though they have been better during the past few days. Dick, Kerrs dropped to 16s. 9d. Callenders are again 5s. up at 12¾, and the rest of the list keeps very steady. The rubber market, too, is firm. Raw Rubber fluc-

tuates narrowly around 2s. 3d. per lb., the changes having little effect upon the share market. For the moment, Borneo rubber shares are popular; but the general tone of the market is robust, and buying orders come in steadily from all parts of the provinces.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1914.	Dividend 1915.	Price Sept. 12, 1916.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	10	10	6⅜	—	£7 18 2
Charing Cross Ordinary	5	5	3 9/16	— 1/16	7 1 4
do. do. do. 4½ Pref.	4½	4½	3 5/16	+ 1/16	6 6 4
Chelsea	5	4	3	—	6 13 4
City of London	9	8	12½xd	—	6 10 8
do. do. 6 per cent. Pref.	6	6	10⅜	+ ⅛	5 15 8
County of London	7	7	11	—	6 7 3
do. 6 per cent. Pref.	6	6	10⅜	—	5 13 0
Kensington Ordinary	9	7	5⅛	—	6 7 3
London Electric	4	3	1⅜	—	6 10 6
do. do. 6 per cent. Pref.	6	6	4⅜xd	—	6 13 4
Metropolitan	3½	3	2⅞	—	5 9 1
do. 4½ per cent. Pref.	4½	4½	3½	—	7 4 0
St. James' and Pall Mall	10	8	6⅝	+ ⅛	6 5 6
South London	5	5	2⅝	—	8 18 10
South Metropolitan Pref.	7	7	1 15/16	—	6 7 3
Westminster Ordinary	9	7	6⅛	—	5 12 0
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	103	— ½	5 16 6
do. Def.	30/-	33/6	23½	—	7 8 9
Chile Telephone	8	8	7	—	5 14 5
Cuba Sub. Ord.	5	5	8½	—	6 3 6
Eastern Extension	7	8	14⅜	— ⅛	*5 8 6
Eastern Tel. Ord.	7	8	147	—2	*5 8 10
Globe Tel. and T. Ord.	6	7	12¼	—	*5 8 8
do. Pref.	6	6	10½	—	5 10 4
Great Northern Tel.	22	22	42	—	5 4 9
Indo-European	13	13	49	—	6 12 8
Marconi	10	10	3 5/16	—	3 2 9
New York Tel. 4½	4½	4½	100	—	4 10 0
Oriental Telephone Ord.	10	10	2¼	—	4 8 11
United R. Plate Tel.	8	8	6⅛	—	*5 16 5
West India and Pan.	1	—	1 1/16	—	—
Western Telegraph	7	8	15	—	*5 6 8
Home Rails.					
Central London, Ord. Assented	4	4	73	—1	5 9 7
Metropolitan	1½	1	25	— ½	4 0 0
do. District	Nil	Nil	18½	—	Nil
Underground Electric Ordinary	Nil	Nil	1⅛	—	Nil
do. do. "A"	Nil	Nil	6⅛	—	Nil
do. do. Income	6	6	89xd	— ½	*6 14 10
Foreign Trams, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	5	—	6 0 0
Anglo-Arg. Trams, First Pref.	5½	5½	3 1/16	— 1/16	7 9 2
do. 2nd Pref.	5½	5½	3	—	—
do. 5 Deb.	5	5	75	—	6 13 4
Brazil Tractions	4	4	60⅜	— ⅜	6 11 8
Bombay Electric Pref.	6	6	10⅝	—	5 14 3
British Columbia Elec. Rly. Pfce.	5	5	72	+1	6 19 0
do. do. Preferred	—	Nil	54½	+1½	Nil
do. do. Deferred	—	Nil	54½	+8½	Nil
do. do. Deb.	4½	4½	68	—	6 5 0
Mexico Trams 5 per cent. Bonds	—	Nil	44	+1	Nil
do. 6 per cent. Bonds	—	Nil	56	+1	Nil
Mexican Light Common	Nil	Nil	19	—	Nil
do. Pref.	Nil	Nil	34	—	Nil
do. 1st Bonds	Nil	Nil	43	—	—
Manufacturing Companies.					
Babcock & Wilcox	14	15	3 1/16	— 1/16	4 18 0
British Aluminium Ord.	5	7	2o/8	+3d.	5 6 8
British Insulated Ord.	15	17½	12½	+ ½	7 0 0
British Westinghouse Pref.	7½	7½	49/6	+6d.	6 1 2
Callenders	15	20	12½	+ ½	8 0 0
do. 5 Pref.	5	5	4½	—	5 17 8
Castner-Kellner	20	—	8½	— ½	5 6 8
Edison & Swan, £3 paid	Nil	—	10/6	—	Nil
do. do. fully paid	Nil	—	1½	—	Nil
do. do. 5 per cent. Deb.	5	5	62½	—	8 0 0
Electric Construction	6	7½	17,6	—	8 11 6
Gen. Elec. Pref.	6	6	10	—	6 0 0
do. Ord.	10	10	14	+ ½	7 2 10
Henley	20	25	16⅝xd	—	7 9 2
do. 4½ Pref.	4½	4½	4½xd	—	5 6 0
India-Rubber	10	10	12½	—	*8 3 4
Telegraph Con.	20	20	89	—	*6 4 0

* Dividends paid free of income-tax.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Month ended (4 wks.)	Receipts for the month. £	Increase. £	No. of weeks.	Total to date. £	Increase. £	Route miles open.	Increase.
Blackpool-Fleetw'd	Sept. 2	10,036	+1,807	35	31,306	+ 2,978	8	..
Bristol (Trams)	„ 1	22,266	+3,009	35	170,604	+ 5,419	30·5	..
Cork	Aug. 31	2,243	+ 112	35	17,735	+ 144	9·89	..
Dublin	Sept. 1	28,740	+3,369	35	209,185	— 8,417	54·25	..
Hastings	„ 1	7,554	+ 1,358	35	36,431	+ 2,043	19·3	..
Lancashire United	Aug. 30	8,440	+ 1,089	35	62,786	+ 2,508	42	..
Llandudno-Col. Bay	Sept. 1	3,570	+ 858	35	14,151	+ 483	6·5	..
Anglo-Argentine	„ 2	194,111	—6,334	35	1,771,989	—11,483	..	..
Auckland	Aug. 25	20,487	- 591	8	41,974	— 55	26 to 9	1·17
Calcutta	„ 26	18,490	+ 643	..	..	+ 6,773	..	..
Kalgoorlie, W.A.	June	2,500	..	26	14,937	..	20.5	..
Madras	July	4,422	+ 127	35	33,563	+ 2,302	..	..
Montevideo	August	26,044	— 449	43	292,852	+18,926	..	..
Dublin-Lucan Rly.	Sept. 1	803	+ 127	9	1,777	+ 204	7	..

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, September 13th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/8	..
a Ammoniac Sal	per ton	£75	..
a Ammonia, Muriate (large crystal)	„	£54	..
a Bisulphide of Carbon	„	£23	..
a Borax	„	£34	..
a Copper Sulphate	„	£51	..
a Potash, Chlorate	per lb.	2/6	..
a „ Perchlorate	„	2/-	..
a Shellac	per cwt.	128/-	..
a Sulphate of Magnesia	per ton	£18	..
a Sulphur, Sublimed Flowers	„	£16	£1 inc.
a „ Lump	„	£13 10	£1 inc.
a Soda, Chlorate	per lb.	1/1	..
a „ Crystals	per ton	120/-	..
a Sodium Bichromate, casks	per lb.	..	..
METALS, &c.			
c Brass (rolled metal 2" to 12" basis)	per lb.	1/2¾ to 1/3	..
c „ Tubes (solid drawn)	„	1/3½ to 1/3¾	..
c „ Wire, basis	„	1/3 to 1/3¾	..
c Copper Tubes (solid drawn)	„	1/6½ to 1/6¾	..
g „ Bars (best selected)	per ton	£150	..
g „ Sheet	„	£150	..
g „ Rod	„	£150	..
d „ (Electrolytic) Bars	„	£132	£3 inc.
d „ „ Sheets	„	£150	£3 inc.
d „ „ Rods	„	£140	£4 inc.
d „ „ H.C. Wire	per lb.	1/4¾	1/16d. inc.
f Ebonite Rod	„	3/-	..
f „ Sheet	„	2/6	..
n German Silver Wire	„	2/3	..
h Gutta-percha, fine	„	6/10	..
h India-rubber, Para fine	„	3/3½	½d. inc.
i Iron Pig (Cleveland warrants)	per ton	Nom.	..
l „ Wire, galv. No. 8, P.O. qual.	„	£36	..
g Lead, English Pig	„	£31 15	15/- dec.
g Mercury	per bot.	£17 12 6 to £17 15	..
e Mica (in original cases) small	per lb.	6d. to 8/-	..
e „ „ „ medium	„	8/6 to 6/-	..
e „ „ „ large	„	7/6 to 14/- & up.	..
d Silicium Bronze Wire	per lb.	1/8½	½d. inc.
r Steel, Magnet, in bars	per ton	£80	..
g Tin, Block (English)	„	£171 to £172	£4 to £5 dec.
n „ Wire, Nos. 1 to 16	per lb.	2/10	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

Official Announcements re Companies.—The following companies are to be struck off the register unless cause to the contrary is shown within three months:—
Commercial & Engineering Development Co.
Engineering & General Purposes Co.
Holmes Motor Speed Controller.
International Power & Light Trust.
Rochdale Electro-Plating Co.

Hong-Kong Tramway Co., Ltd.—The directors report a net profit, after writing £6,625 off for depreciation, and including £6,897 brought forward, of £18,071. A dividend of 12 per cent. has been declared, and a further £2,000 has been written off the cost of the tramway undertaking, leaving £6,321 to be carried forward.

Dundee and Broughty Ferry Tramways Co., Ltd.—The net profit for the year ended July 31st was £2,595, including £109 brought forward, after providing for interest and £785 in redemption of debenture stock. After paying the dividend on the preference shares £165 is to be carried forward.

United Electric Car Co., Ltd., Preston.—In their report for the year ended June 30th, 1916, the directors state that the works have been efficiently maintained as regards building and machinery, the cost of which has been charged against revenue. After charging £5,229 for depreciation, including £4,500 added to reserve, the profit for the year is £6,563, plus £4,707 brought forward, making £11,270. After paying the preference dividend, less income-tax, requiring £6,000, £5,270 is to be carried forward. Annual meeting: September 20th.

Browett, Lindley & Co., Ltd.—According to the "Financial Times," an interim dividend at the rate of 6 per cent. has been declared.

Gandy Belt Manufacturing Co., Ltd.—Interim dividend, 8 per cent. actual, less tax.

THE BRITISH ASSOCIATION.—II.

The Engineering Section of the British Association, when it met in Newcastle-on-Tyne on Thursday, September 7th, had a very busy day in front of it, for the agenda was so full that practically no time was left for discussion. The programme originally was a heavy one, but it was made worse in consequence of the addition to the lists of papers to be read, of that of Dr. T. E. Stanton, F.R.S., on Principles of Similitude. Other subjects treated were: Standardisation and its Influence on the Engineering Industries, by Mr. C. le Maistre; Pressure Oil Film Lubrication, by Mr. H. T. Newbigin; The Influence of Pressure on Electrical Ignition, by Prof. W. M. Thornton; The Calculation of the Capacity of Aerials, including the Effects of Masts and Buildings, by Prof. G. W. O. Howe; and Some Characteristic Curves for a Poulsen Arc Generator, by Mr. N. W. McLachlan, as well as a report of the Committee on Complex Stress Distribution.

The Chemistry and Geology Sections joined hands on Thursday morning to consider the investigation of the chemical and geological characters of different varieties of coal, with a view to their most effective utilisation as fuel and to the extraction of by-products. This discussion, which formed a sort of prelude to the discussion of Friday between the Engineering and Chemical Sections on fuel economy, &c., was taken part in by Prof. G. A. Lebour, Prof. W. A. Bone, F.R.S., Dr. A. Strahan, F.R.S., Dr. J. T. Dunn, Dr. Marie C. Stopes, and others. At the same time the Economic Section was engaged in the discussion of a report of a Conference on the Replacement of Male by Female Labour.

The subject of fuel economy was one of the outstanding features of the Association's meetings on Friday, and, as mentioned, was jointly debated by the Engineering and Chemistry Sections. A long, but very interesting and practical, debate had for its basis, first, the First Report of the Committee (of which Prof. W. A. Bone was chairman) Appointed for the Investigation of Fuel Economy, the Utilisation of Coal, and Smoke Prevention. This report went over the ground very thoroughly, and in effect stated that there was practically as great a need for coal saving as ever. The Committee, so far, had been occupied by organisation and a survey of the ground which must be explored later on. The Committee recommended its re-appointment, in order that it might continue its investigations. In addition to this, there was a paper by Mr. R. P. Sloan on Fuel Economy on the North-East Coast as a Result of Electric Power Supply, and another subject that was broached was Electric Power Distribution, by Mr. Charles H. Merz. Amongst those taking part were:—Prof. W. A. Bone, Dr. J. T. Dunn, Mr. H. J. Yates, Sir Hugh Bell, Prof. Louis, Sir C. Parsons, Dr. Dugald Clerk, Prof. H. B. Dixon, Dr. Des Vaux, Mr. W. B. Woodhouse, Mr. McLaurin, Mr. Chamen, Mr. Chattock, and others. The discussion was of a very high character, and formed a very fitting close to the Section's proceedings.

Address to the Engineering Section.

By Gerald Stoney, F.R.S., President of Section G.

(*Abstract.*)

At times such as these the mind naturally turns to problems to be considered both at the present time and after the war, and in considering such problems, a review of some of the errors committed in the past is most necessary. Such a review enables methods which should be adopted, both now and in the future, to be considered.

One thing which has handicapped the engineering and allied industries is the reluctance of firms to utilise highly educated labour or to adopt scientific methods. In looking round the industries of the district one is struck by the small number of men who have undergone a thorough scientific training at one of the universities or at one of the leading technical colleges, and who occupy a prominent place in the firms in this district.

The general complaint is that university and college men are too theoretical and not practical. It is the usual thing for a bad workman to blame his tools, and is it not because employers do not know how to make use of such labour that they utilise it to such a small and imperfect extent?

Things are very different in some other countries with which we have competed in the past, and with which there will be in all probability still fiercer competition in the future. There we find the fullest use made of highly educated scientific labour.

How many engineering firms in this district have a skilled chemist on their staff, and what percentage of these pay him a decent salary? And how many heads of firms have sufficient chemical knowledge to appreciate the work of and utilise the services of such a man?—because unless there is appreciation of the work done by such a man his services are useless and he becomes discouraged, and yet chemical problems are continually cropping up in engineering work. There is the question of the supply of materials; as a rule the manufacturer trusts to the name of the contractor and assumes that he gets materials of the composition and purity he ordered. Every now and then something goes wrong and the question arises, why? Without a chemist to analyse the material it is often most difficult to say. Apart from this question of the analysis of raw or partly manufactured materials received, there is the chronic question as to the mixtures of the metals in both the metal and brass foundry, and large economies can be effected by systematic analyses.

Another direction in which scientific labour is invaluable is in seeing that instruments are in proper order and that tests are accurately carried out. Tests carried out with inaccurate instruments and without proper scientific precautions to see that they are accurate and reliable are worse than useless, and, in fact, most misleading and dangerous, as entirely unreliable inferences may be drawn from them and far-reaching troubles caused in the future. How many tests of steam engines are unreliable because there is no standardisation of the pressure and vacuum gauges and thermometers used, and in how many cases is even the reading of the barometer omitted? An absolute pressure stated as so many inches of vacuum has no meaning unless the barometer reading is also given or the inches of vacuum is stated as reduced to "Bar. 30." How many firms using steam have any arrangements for testing vacuum and pressure gauges, and yet there are no instruments more liable to error than these gauges? Under scientific supervision arrangements are made to avoid such troubles and get reliable results which can be depended on for future designs.

What has been said about pressure gauges and the measurement of pressure applies, of course, to all other instruments and measurements. In most works, it may be said with sorrow, that the only moderately accurate measurements that can be made are those of dimensions and weight. It is only by accurate testing of existing plant that reliable deductions can be drawn enabling safe progress to be made in future designs.

One of the great things which helped forward the steam turbine in the early days was accurate and full testing of each plant as soon as it was completed and before it left the works. The late Mr. Willans was probably the first, or one of the first to recognise the importance of accurate testing of steam plant, and the success his well-known engine had was largely due to this. From the earliest days of the steam turbine, Sir Charles Parsons recognised the necessity of such testing, and the test house has always been a prominent feature of Heaton Works. And then in the higher ranks of an engineering works it requires a scientific mind to draw safe conclusions from tests carried out and to see in what directions progress can be safely made. Such methods have enabled the steam turbine during the writer's acquaintance with it, now extending over some 28 years, to grow from 50 H.P. to some 45,000 or more in each unit, and the steam consumption to be reduced from 40 lb. per H.P.-hour to about 7½ lb., or less than one-fifth.

Closely allied to such work in engineering works is the general question of scientific research, and here a trained scientific mind is of the utmost importance to see that reliable results are obtained and to make true logical deductions from those results. Without suitable training a man is liable to be unable to grasp all the conditions of an experiment, and to make deductions from the data obtained which are totally unjustified and often lead to most disastrous results in the future.

Such research is generally carried out in four places—engineering works, private laboratories, engineering colleges, and national laboratories.

The first has already been dealt with.

The second is of comparatively small importance in practice.

As regards the third, a great deal of good work has been done in engineering colleges, often under great difficulties for want of plant and money, and it is greatly to the credit of our professors and others that they have succeeded in doing so much with the very inadequate appliances at their disposal, and handicapped for want of funds. How inadequate their income is can be understood when it is remembered that Leipzig University alone has an annual income from the German Government of £100,000, as against a total Government grant to *all* the universities here of about £45,000, or less than half.

Of national laboratories we have only one, the National Physical Laboratory at Teddington, and here again the support given to it is totally inadequate. The total income from all sources last year was only £40,000, and of this £23,000 was charges for work done, such as testing meters and other instruments and such commercial work; the Government grant is only £7,000 a year, and besides this £7,500 was

received for experiments in connection with aeronautics, which is really war work. The balance was made up of subscriptions, grants from technical societies, and miscellaneous receipts. Compare this with the German equivalent, the Reichsanstalt, of Berlin, which has an income of £70,000 a year from the Government, or ten times that given to our N.P.L. The Bureau of Standards, the similar institution in U.S.A., has a Government grant of £140,000, or 20 times ours. In the Civil Service Estimates there is an allowance of £40,000 for research, an increase of £15,000 over that allotted last year. The total estimates are over £20,000,000, so that less than one-fifth per cent. is allotted to research.

It is difficult to realise what benefits might be gained by investigations which could be carried on by the N.P.L. if only sufficient funds were available, and of what importance they might be to industry at large. One example may suffice. Some time ago the Reichsanstalt carried out a most complete set of tests on a certain class of machine, an investigation which must have cost several thousands of pounds sterling, apart from the time it occupied. The results of this investigation are available to German manufacturers of this machine, and just before the war preparations were being made to take advantage of this, and from figures stated a large extra economy was expected. This, of course, would enable them, provided the cost of manufacture was not too high, to have an enormous advantage over such machines manufactured without this special knowledge. The Institution of Mechanical Engineers saw the importance of this problem and appointed a Research Committee to deal with the question, but the first question met with is that of finance. Should this be the case in a wealthy country such as this, that depends on its manufactures for its very existence? That such an investigation is required is obvious from the fact that the designs of no two independent manufacturers of this machine in this country agree among themselves. Of course, each claims that his is the best, but this cannot be so.

Investigations in engineering shops do not meet such a case. The question of finance has to be carefully watched, and as soon as results sufficiently good are obtained they are generally accepted; in any case the problem is rarely thrashed out to the bottom, an almost universal defect in commercial research work. Without the help of the National Physical Laboratory the position of the aeroplane in this country would be very different from what it is, and what has been done for the aeroplane requires to be done in many other directions.

But what firm here would do what has been done in the commercial synthesis of indigo, on which it is said that 17 years' work and over £1,000,000 has been spent by one firm alone abroad? Here in chemical investigations and manufactures the Government refuse even to help by allowing cheap alcohol to be obtainable, and much of such work is impossible in this country on this account, as in many cases methylated and denatured alcohol are not suitable. Recently, under pressure, the restrictions have been somewhat relaxed by the Government, but many manufacturers have found that the privileges granted are so tied up in red tape that the concessions are practically useless.

And it is not only on the scientific side that there is so much to be done in the way of putting our house in order; there is much to be done in the way of putting the management and commercial sides of engineering and other allied works in a position to compete.

The great growth of engineering works and their being formed into limited liability companies has not been without its drawbacks.

In the old days an engineering works was comparatively small and, as a rule, one man, generally a clever engineer, was at the head. After his death, and often before, the place was turned into a limited liability company, and gradually fell into the hands of a body of men, many of them not technical, who had no further interest in the firm than to draw their salaries as directors and managers, and who had no financial stake in the concern beyond the £500 or £1,000 in shares necessary to qualify them as directors. The result is that the place gradually degenerates, initiative ceases, and its finally gets to a stage of not paying any dividends, and really being kept going, not for the sake of the shareholders, but of the directors and other officials.

Such a firm as a rule does not put enough aside for depreciation, and thus its machinery and buildings degenerate and become obsolete, which makes it still less able to compete with more modern firms. At the same time it is not able to afford the money necessary to carry on the experimental and research work which is a necessity for any progressive firm, and thus its manufactures cease to progress with the times. As Sir Charles Parsons truly said, a man or firm in the face of financial difficulties cannot carry on research work, and, further, the minimum spent on research work should be at least 1 per cent. of the turnover, and the amount it is advisable to spend is 3 per cent. Unless a firm makes good profits it cannot keep up-to-date, and will sooner or later go to the wall.

But the workman says that he should have his share. What is his share under the present state of things? The average capital expended in an engineering works per individual employed is about £200. An investigation the writer made some years ago gave this figure, and it was confirmed by an investigation of shipbuilding yards, which gave £185, and of the census of production, which gives a capital of £1,500,000,000 for 7,000,000 workers, or £214 per man. An investigation of the dividends paid shows them to be about 4 per cent. on the capital employed. Here it must be remembered that firms paying 10 to 15 per cent. on their ordinary capital have often a large preference and debenture capital, on which a much lower rate of interest is paid, and also that often part of the ordinary capital was issued at a premium. Also, account has to be taken of the large number of companies that do not pay any dividend on their ordinary stock, and often none on their preference. Little is as a rule heard of the finances of such companies; it is the ones paying good dividends that public attention is drawn to.

It thus means that the shareholders get about £8 per year per individual employed.

On the other hand, the average wages for men and boys, skilled and unskilled, is about £70 per annum in normal times. This means that the worker gets between eight and nine times as much as the capitalist, and shows on what a very small margin the capitalist works. And without the capitalist, under our present system of individualism, there would be no factories erected and run, and therefore no work for the working man, a thing it is well for him to remember, and also that without profits the capitalist will not invest in engineering and other works in this country, but will seek a more profitable field for his capital elsewhere. Every £200 invested in this country in a factory means work and livelihood for one British working-man.

At the same time, I am sorry to say the employer does not look after the welfare of his workmen as he might. In a small factory the head of the firm, as a rule, knows all the leading men among the workmen, many of them having been with him for years. As the place grows he loses touch with his men, and as an actual fact knows fewer of those under him when he has 1,000 or more employés than he did when he had 400 or under. This state of things gets worse when the place is turned into a limited liability company, as nearly all large places are at present. The result is that a most deplorable state of things has come to pass. The workman says, "Put not thy trust in employers"; the master says, "Put not thy trust in workmen"; and the official, who is between the master and the workman, says "Put not thy trust in either."

It is difficult to say what is to be done to remedy this state of things, but one cannot help feeling much might have been done in the past to prevent such a regrettable state of affairs as there is at present. Much of this trouble might have been avoided if employers had shown more consideration for the welfare of their workmen. Of course, there are some notable exceptions, but they are few and far between. An example is the necessity of the Factory Acts to ensure proper light and air and other arrangements necessary for the health of the workmen. But much more should be done. Why is it that canteens are being rushed up all over the country, and why were there so few before? In many works to this day the provisions for getting food and drink warmed are most primitive and inefficient, and as to getting anything to eat if one has to work overtime unexpectedly, it is in most works impossible. As a rule the only thing available was a drink at the public-house outside the gates, and even this is now closed at five o'clock. Why, if a man works overtime, should he also starve? And how can efficient work be expected under such conditions? Why also should there not be provision for drying clothes after walking to work on a wet morning, and each man be provided with a cupboard where he could keep a change of boots? Why are not sanitary arrangements decently private, and why are they not kept clean and wholesome: they are often in a disgraceful state? These are only a few samples of the directions in which much might be done.

The adjustment of the wages to be paid to the workman is a most difficult one. There are three principal ways of paying workmen: on time, on piece, and on bonus.

On time is the only way of paying a man who is on various classes of work, where the fair time required for each job is not known, and in many cases the most highly skilled men are on such work and as a result only make time wages. This results often in the highly skilled man making less money than the less skilled man who is on repetition work, and as a consequence is working on piece or bonus, and this is obviously unfair. For example, a man may have the setting up and adjusting of a number of machines on repetition work, and he often makes less money than the less skilled men under him who are on piece or bonus, although their nominal rate of wages is less than his.

Again, highly skilled erectors who go outside the works to erect machinery, often worth thousands of pounds, and set it to work, are only paid on time, and often make less money than their fellows who are on piece inside the works.

The adjusting of piece prices is a most difficult one. They should be adjusted so as to be fair both to master and man, but too often such fixing of prices is left to subordinate officials who have in many cases their own axe to grind. There should in every works be a special department for such fixing of prices, and once a price is fixed it should not be altered without good reason. The practice of cutting prices by the masters in the past is, in the opinion of the writer, largely responsible for the present limitation of output by

the men about which we hear so much. There is a rule that if a man makes more than time and half or time and third the price of the job is to be cut. If the price has been fairly fixed why should it be reduced because the man makes large wages due to his skill and industry? The larger the output from his vice or lathe the better for the master, as he is getting a larger output from his plant with a certain capital expenditure, and thereby establishment charges are reduced. This is especially the case in machine work, as the hourly value of the machine employed often far exceeds the wages of the workman employed.

A fair rating for machine tools is 4d. per hour per £100 value, and as the time rating of the man is generally about 9d., it is easily seen that if the average value of the machine tools exceed £225, machine charges exceed time wages, and the average value of machine tools is generally largely in excess of this figure, in fact often about double it. It is therefore obvious that it is much more important to get large output than to pay small wages.

The result of this "time and half" rule is that a good man by working up to the limit of his capacity "spoils the job" for the next man who comes along, and may not be of the same calibre as the first man. It has therefore been found advisable and necessary by the workmen to limit the output of all men to a certain standard, and this results in the end by the pace being set by the slowest man on a particular job.

A fair bonus system is perhaps the ideal way of paying men, but here, again, although the times for a job are supposed to be fixed and unalterable, in too many cases they have been altered by various devices, and as a result the system is looked on with suspicion by the workman.

Gradually, bit by bit, the pernicious doctrine that the less work done by a man the more employment there will be has grown up, he not seeing that the cheaper an article can be produced the larger will be the sale for it and the better it will be able to compete with the products, not only of other producers in this country, but of those abroad. And also that very cheapness, combined with good quality, induces the sale for such articles to be large.

Laziness is inherent in man, and *on an average* no man will work unless compelled to do so, and still less will work his best unless there is a great inducement. This is true not only of the working-man, but of all other classes. Therefore the policy of "ca' canny" has been only too readily adopted on the ground not only that it was pleasant for the man himself, but also he believed that it tended to the welfare of his fellow workmen.

The writer has very reluctantly come to the conclusion that the workman of to-day is not doing as much work as was done some 30 years ago, when he was in the shops, and not only this, but that timekeeping is not as good. In this connection, however, it must be remembered that excessive overtime inevitably leads to bad timekeeping.

Bad timekeeping causes much more loss than that due to the actual time lost, as not only does machinery and other plant lie idle, but the disorganisation caused in a works by lost time is most serious.

With the growth in strength of the trade unions, which at first were for the legitimate object of seeing that the workman got fair play, and providing out-of-work and old-age benefits, &c., has grown up a system of trade union officials who live by agitation, and whose job would be gone if there were no supposed grievances to agitate about. These men keep the Labour world in a constant state of agitation, and make the employers' and officials' existence a burden to them by constant demands of all sorts, many of them utterly impracticable and unfair. When they cannot agitate against the employer they agitate against another trade union, and thus endless disputes spring up on the demarcation of work. Some of the worst strikes in the past have been due to disputes between two trade unions.

Unless something can be done to bring master and man together and make both work for the common good, English trade must inevitably go down, and the supremancy that England has in the engineering of the world will come to an end.

Nothing ever was a truer statement than that recently made by Lord Joicey that this country, unless it produces as cheap or cheaper than other countries, cannot in the long run keep her trade, and this is true in spite of any tariff walls which may be set up. And if the present state of affairs is maintained of unscientific management and obsolete machinery, combined with limitation of output and high wages, or, in other words, high cost of production, we must, sooner or later, go to the wall.

What is really wanted is common honesty and common sense on both sides, for one side is as bad as the other at present.

And now about the official, who is in all grades from the manager down to the foreman, and who comes between the master and the man. Unless he is treated fairly by the master, and unless he treats his men fairly, there is sure to be friction and loss of efficiency. He must also work with his fellow-officials, who move in lines more or less parallel to his, and here, to prevent jealousies and to prevent the more unscrupulous among them taking unfair advantages, demarcation of each official's duties and work is most important. This is a point often omitted to be taken sufficiently into account in the organisation of a works, and often causes most disastrous results. The duties of each man should be clearly defined by the master, and no interference with those of others tolerated. The master also should remember that the official has no trade union or similar organisation to protect him, and should act accordingly. Much more could be said about the relations of the official both with his fellow-official who is on the same level as himself, with his master who is above him, and the workman who is under him, but time forbids. On all three sides much improvement could be effected. The fact remains, however, that for success it is essential that all from the apprentice to the head of the firm should work as one homogeneous whole.

Apart from the considerations set out above, combinations among the firms employed in any one trade are most essential for the well-being of that trade. It is by such combination that much of the progress made of late years by our competitors has been effected. Some of these combinations have been international, and at least two such in the engineering trade before the war were so. These now, of course, are, and it is expected will be after the war, confined to the allied and possibly to neutral countries, but such combinations, whether among all the engineering firms in one district or among firms employed in one particular trade, to be successful must be worked fairly to all members, and the larger firms must not override the smaller, as, it is regrettable to say, has been done in combinations of employers in some districts. For example, in a district where there is one firm very much larger than any of the others, it is not unknown for it to act the bully and insist on everything being done to suit its requirements, regardless of the rights of others. And, further, such combinations are, unless directed by men with broad minds and able to take a wide view of things, liable, especially in case of emergency, to do much harm.

If the Armament Ring in this country had taken such a view when it was found what an enormous supply of munitions was required, it is doubtful if there would have been such a shortage as there has been. Hundreds of firms were willing and anxious to help in the production of munitions, but when they offered their services they were met in many cases with a blank refusal, and in all cases with little encouragement. And when, under pressure from the Government, the Ring accepted outside help, in many cases the conditions imposed on the sub-contractors were unfair in the extreme, apparently the whole idea of the Ring being to make all the profit they could out of the troubles of the Empire. It has been just as difficult to persuade the Armament Ring to give up what they thought was their monopoly and to bring in outside works to help in the production of munitions as it has been to persuade the trade unions to forgo trade customs and to enable outside sources of labour to be employed, such as women and other unskilled labour. But both have had to do it. In other words, "dilution of works" has been as difficult to effect as "dilution of labour," and the position both of the Armament Ring and of the workman would have been very different if they had consented freely to it when it became obviously necessary for the safety of the Empire.

Combination among workmen is admittedly a necessity if they are to have fair play, but combination among employers has come later, and is equally a necessity.

At present most of the principal federations of employers deal only with wages questions and questions affecting labour, but they require to be extended so as to take in all branches of the business of engineering. Labour has long seen the importance of federation; it is now for Capital to do the same. One of the great difficulties has been that certain firms would not join, and a very small proportion acting thus weakens the whole to a much greater extent than the actual ratio of this small proportion to the whole. It is easy to see how alive Labour is to this by the constant trouble over the non-union question, and this is well put in the notice addressed last March to the transport workers of the Mersey district: "To be outside a union is to be disloyal not only to your own class but to yourselves individually." What applies to Labour also applies to firms; for a firm to be outside the federation is to be disloyal, not only to its fellow-firms but to itself.

Such a state of affairs is not tolerated in some of the countries competing with us, and it is questionable whether action by the Government is not advisable.

An example of the mischief done by a few who would not fall into line with the many is seen by the necessity for the Act compelling the early closing of shops one day a week. The great majority were ready to close, but the action of a small minority prevented their doing so, and in the end compulsion had to be used on the minority. Legislation has not been necessary to prevent "black-legging" in the labour world, since other methods have been used which have been practically successful, but it is quite possible it may be necessary to use compulsion to make firms toe the line.

Such combinations are not only for labour questions, but also for all other subjects affecting the engineering industry at large, and more especially the special industries in which any one firm deals. Thus they resolve themselves into general federations of all engineering industries and minor ones dealing with particular trades. The former deal chiefly with labour questions and questions affecting the industry as a whole, the latter with those affecting any particular trade.

Among the questions coming up to be considered by the latter class is the standardisation of specifications and conditions of contracts, as well as in some cases the adjusting of prices to avoid unfair competition and to put the whole trade

on a paying basis. Much has been done in this direction with most advantageous results in certain cases, but much more remains to be done if this country is going to hold its place in the world.

The necessities of research work have already been dealt with, and by the pooling of such research work enormous advantages in any one trade could be obtained. Such pooling of information has been effected with most beneficial results, especially in the chemical trade abroad. Any workable scheme which would enable this to be done and get over the jealousies between one firm and another would be of enormous benefit to the trade in general.

Another thing that must not be lost sight of is the urgent need of improving our educational system. It is little short of a disgrace that the older universities are closed to those without a knowledge of Latin and Greek.

Languages are of the greatest importance to an engineer, but not dead languages but live ones. And these should be properly taught, so that the student should not only be able to read and write about them, but also to speak and understand them. It is quite a different knowledge of a language to be able to read, write, speak, or understand it. Many people can read a language without being able to write, speak, or understand it, and conversely it is not uncommon to meet people who can speak and understand a language without being able to any large extent to read or write it. And it is only in live languages that a man is trained to speak and understand a language.

Why is it that we are so wedded to the dead languages? There is, of course, the tradition that such are necessary for a liberal education, and there is the argument that modern languages are not as good a training for the mind. Granted that they are not quite so good from the point of view of learning to read and write them, does not the fact that they can also be taught as a live language to be spoken and understood, make them on the whole the best educationally for a man? This is entirely apart from the fact that modern languages are useful and ancient useless to the man in commercial work. There is, of course, bitter opposition from that most conservative man, the schoolmaster, and one great reason is that it is much easier and cheaper to get a man to teach Latin and Greek than modern languages which have to be taught orally. The teaching of Latin and Greek as it is usually taught has been standardised to the last degree, and as a result they can be taught by the "semi-skilled" man, and a "skilled" man is not necessary, to use engineers' phraseology. In fact, the teaching of Latin and Greek is a pure "repetition job." At the same time, no education is complete unless science is combined with languages and also literature, and here lies one great danger of modern technical education.

And after the boy has left school and enters the shops, more facilities should be given to enable him not only to keep up but to continue his education. In the shops and drawing office, too often the boy is left to pick up a knowledge of his trade as best he can. The apprentice who asks questions is often looked on as a nuisance, and requests for information are generally met by a blank refusal or worse. Often the foreman or chief draughtsman is afraid to answer questions for fear of being charged with giving away so-called "trade secrets," but an immense deal of information can be given to an apprentice without doing so.

Evening classes are all very good in their way, but more facilities should be given for the diligent apprentice to attend day classes, and this can be arranged in various ways if the employer has a will to do it. A thing that at present often prevents boys desirous of educating themselves from getting on is the fact that overtime is allowed as soon as a boy is 18, and often he is compelled to work overtime regardless of classes that he ought to be attending.

It is important to remember that the boy of to-day is the man of to-morrow.

One complaint is that after a lot of trouble is taken about a boy he leaves after a few years and goes to another employer. The good of the trade in general must be considered, and a man who has had experience of various classes of work is generally a much more valuable man than one whose knowledge is confined to one class only. In any case, the other employer gets the benefit of what has been done by the first, and thus the trade in general benefits.

It is felt that this is a very imperfect review of things as they are at present, but if this address induces all classes engaged in engineering to consider how things can be bettered the author feels that a part, at all events, of his object has been attained.

Electric Power Distribution.

By Charles H. Merz.

(*Abstract of contribution to the discussion on Fuel Economy.*)

"*It appears that . . . . the coal should be converted . . . . into a form in which it is most generally applicable to all purposes without exception, and in which it is most easily applied to all our wants, and is at the same time in a form in which it is most difficult to waste or use improperly.*

"*We are therefore forced to the conclusion that the only complete and final solution of the question is to be obtained by the conversion of the whole of the coal which we use for heat and power into electricity, and the recovery of its by-products at a comparatively small number of great electricity producing stations. All our wants in the way of light, power, heat, and chemical action would then be met by a supply of electricity distributed all over the country.*"—[Extract from presidential address of Mr. S. Z. de Ferranti to the Institution of Electrical Engineers in 1910.]

The fuel and other economies and the industrial advantages of dealing with electricity supply for the country as a whole in a comprehensive manner—although appreciated and acted upon by many of those who are in the electric supply business—are not generally realised to-day by the industrial community or by the State.

The compact nature of our industrial districts and their proximity to each other as compared with those of other countries, such as the United States and Germany, make it economically possible and advantageous to deal with all the power requirements of the community in each industrial area from interconnected electrical power distribution systems tapping all sources of power, however scattered, and delivering electrical energy wherever required.

Power undertakings (electric power companies) have been started in most of the industrial areas of the country, and if these were developed throughout the country to the same extent as the system which has been for some time in operation on the North-East Coast, it is estimated that the resultant economies in coal consumption would, in the near future, amount to 25,000,000 tons per annum, and eventually to 50,000,000 or 60,000,000 tons per annum.

While on the North-East Coast and also in some other districts the generation and supply of electrical power is being developed on correct lines, it is still broadly true to say that, as regards the country as a whole, the requirements of each municipal area are dealt with separately, with the result that the average size of generating machine employed is certainly not more than a tenth—and probably not more than a twentieth—of what it ought to be. Under such conditions economical coal consumption is impossible. The result is cumulative because, on account of the small size of generating machine employed in public stations and the consequent low economy, manufacturers, railway companies, and other large power users in many districts are still compelled to run power plants of their own, and the use by many manufacturers of their own plant further reduces the average size of power generating machines, taking the country as a whole.

The only way in which public supply stations can secure the business of supplying all the manufactories in their neighbourhood is to have generating machines much larger than the largest individual manufacturer could find use for.

If instead of each municipal area being dealt with independently, there were one uniform interconnected electrical power distribution system throughout each industrial area, as we now have practically throughout the North-East Coast district, just as there is one railway system throughout the country with a uniform gauge, it is clear that, on account of the magnitude of the resultant load, it would be possible to secure the following results:—

1. The largest and most economical generating machines could be installed.

2. These could be located where large sites are available and land is cheap; where coal and water facilities are good; and in the best position having in view the probable eventual power requirements of the whole community, including factories, railways, and domestic users.

As regards reliability of supply—an essential condition—concentration of generating capacity in large units in conjunction with a main electrical power distribution system is not a source of danger, but the reverse, because by means of such an interconnected distribution system, one set of generating plant can act as spare to another, whereas, according to the present method of dealing with electricity supply by means of isolated networks, each supplied in general from one generating station, there is no duplication of generating stations or alternative ways of feeding a given area whatever.

Thus, if the community is to benefit by the electric supply industry being given the maximum chance of development, and if the erection of the most economical generating machines in the best possible positions for economical production is to be secured, and insisted upon, as it must be, by some central authority, the first thing to aim at is the establishment in each industrial district of a common interconnected electrical power distribution system.

As has already been indicated, such an ideal may be achieved in this country, on account of its compact nature, to an extent which is not possible in other countries. What is required is co-operation and joint working between the different company and municipal electric supply undertakings, and this, except in certain cases, has not been possible in the past, due largely to Parliamentary and municipal opposition. Many municipal undertakers are now as convinced as the power companies that this joint working is essential.

The erection of plants on roomy and efficient sites would materially facilitate the extraction of the by-products which can be obtained from the coal before it is consumed in the boiler furnace, wherever it is commercially possible to do so. Such by-products may be of as great a value to the community as the residue of fuel. It has been calculated that the requirements of the country in the way of manures, crude oils, oils for marine propulsion, and motor spirit for road traction can all be largely supplied as a by-product of our

own normal coal consumption, if only proper encouragement is given to the establishment of really economical electrical power distribution systems throughout the country.

An urgent matter for settlement is the standardisation and unification as rapidly as possible of the frequency and voltage adopted for distribution purposes in neighbouring localities. It is not proposed that uniformity of frequency and voltage should be established throughout the whole country, as this would entail the scrapping of a very large amount of valuable plant, but there would be no difficulty (and considering the issues at stake, comparatively little expense) in standardising a single frequency for each of the industrial areas of the country as follows:—

Midlands	25 cycles.
West of Scotland	25 ,,
North-East Coast	40 ,,
Lancashire	50 ,,
Yorkshire area	50 ,,

As regards the voltage, this will require careful consideration; on the North-East Coast we have standardised 20,000 volts, and in some of the other areas 10,000 volts has been adopted, but it is a question whether this is not too low for main trunk lines.

The Board of Trade already has a right to say what system (electrical) shall be adopted as regards all new undertakings or existing undertakings developing newly-acquired areas. As regards municipal undertakings which propose to adopt and/or extend electrical systems (plant or mains) of a type which would be inconsistent with development on uniform lines throughout the area in which they are situated, the Local Government Board could attach a condition to the loan to prevent this. The privately-owned concerns are not, of course, subject to Local Government Board control, but the powers of the Board of Trade as regards the sanction of systems to be adopted would probably be sufficient, and in any case the large power companies, who are the most important of the private concerns, operating as they do over large areas, are already fully alive to the necessity for standardisation and unification.

What is important is that a main interconnected electrical power distribution system should be established in each industrial area as soon as possible. To-day if a colliery owner has small and poor coal in his colliery which it does not pay him to bring up because it cannot stand the cost of transport, he cannot contemplate turning it into electricity at the pit mouth—extracting the by-product in doing so—because, except in certain areas where a trunk main system exists, there is no market for the electricity, there being no means of distributing or transmitting it. If a man has waste heat—or could, by improving his manufacturing or chemical process, combine it with the generation of power—there is no one to take his power.

In the above remarks I have considered the matter chiefly from the point of view of saving fuel; it is worthy of note, however, that interconnected electrical power distribution systems are essential if the capital charges and labour costs, which are very important items in the production of electricity, are to be kept to a minimum. This arises from the fact that it is only by supplying all the needs of the community from one system that the maximum use can be made of the plant. As a great many individuals in a given community do the same thing at the same time, what we must take advantage of is that the individual does not and cannot do half-a-dozen things at once. The economy of the combination of all requirements, power, traction, heating, and lighting is fundamental.

What is fundamentally and immediately necessary is the establishment of a national electrical trunk mains distribution system.

Proceeding on these lines we shall not be merely copying America or Germany—we shall be doing something that is right for England because it is England, and because England is radically different from other countries as regards the technical development and "lay out" necessary to secure cheap power. We have delayed making a start on right lines 15 years longer than was necessary; let us delay no longer.

The Production of Tungsten.—The tungsten production of the United States during the first six months of 1916 exceeded the production of that or any other country in any previous 12 months. Prices reached more than 10 times their ordinary level. The output was equivalent to about 3,290 short tons of concentrates carrying 60 per cent. WO_3, valued at $9,113,000.

The total domestic output for the 12 months ended June 30th, 1916, probably amounted to about 5,000 tons.

The tremendous increase of prices caused by the need for "high speed" tools to cut war steel ordered by the governments of Europe caused the great increase in production.

The rapid increase in prices caused prospecting and consequent discoveries of new deposits, increase of development of known deposits, the operating at high pressure of old mills, and the hasty building of new mills. As a result, the production increased faster than the consumption and soon overran the demand that would absorb the output at the extremely high prices prevailing, so that a drop in prices was inevitable. June closed with the price around $25 a unit. The normal price has been $6 to $7.—*Science.*

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

UNION OF SOUTH AFRICA.—By the provisions of Act No. 37 of 1916, various amendments have been made in the import duties specified in the South African Customs Tariff Act of 1914. These amendments consist partly of the increased duties imposed last year, which lapsed on March 31st, 1916, and which are now re-imposed till June 30th, 1917, unless otherwise enacted by the Union Parliament; and partly of new duties which have no date assigned for their termination.

Among the duties re-imposed as mentioned above is the general *ad valorem* rate of 20 per cent. on "all goods, wares, and merchandise not elsewhere charged with duty and not in the Free List and not prohibited to be imported," with a rebate of 3 per cent. *ad valorem* on goods produced in the United Kingdom or reciprocating British Possessions. This item includes such electrical goods as electric torches and refills therefore, spare printed records for electric meters, electric motor hair brushes, electroliers, and electric fuses for blasting purposes.

BRITISH INDIA.—New regulations dated July 22nd last prohibit the importation, otherwise than by parcel post, of all goods from the United Kingdom which had previously been imported into that country from Norway, Sweden, Denmark, Belgium, Holland, and Switzerland, unless copies of the "Specification for Foreign and Colonial Merchandise" (Form 30) or the "Shipping Bill" (Form 64), as the case may be, duly certified by the Customs authorities in the United Kingdom, are presented to the Customs collector at the port of import in respect of such goods.

It is provided, however, that this shall not apply to goods which, on import direct from the foreign countries specified above, are not required to be covered by certificates of origin. It is provided also that the Customs collector may, in his discretion, allow delivery of any goods exported from the United Kingdom which have been imported into that country from the other European countries aforesaid, even if unaccompanied by certified copies of the documents above prescribed, on condition that the importer executes a bond to the amount of three times the value of the goods for the due production of the prescribed documents within a period to be specified in the bond, or furnishes a deposit to the like amount which shall be liable to forfeiture if the said documents are not produced within such period as the Customs collector may direct.

PORTUGAL.—As a consequence of the passing of the Anglo-Portuguese Commercial Treaty Act, 1916, which received the Royal Assent on August 23rd, the Treaty of Commerce and Navigation between Great Britain and Portugal which was signed at Lisbon on August 12th, 1914, and ratified on May 20th, 1916, will come into full force and effect as from September 23rd.

Under Article 5 of the Treaty the trade of the United Kingdom will benefit by the application, to certain classes of articles produced or manufactured in this country, of the special rates of duty which have been conceded by Portugal in respect of such articles under her commercial arrangements with Russia, the Netherlands, and France.

Article 8 exempts merchandise produced in one country and passing in transit through the other from all transit duties, &c.

Article 10 contains the following provisions in regard to commercial travellers and their samples:—

"The stipulations of the present Treaty with regard to the mutual accord of the treatment of the most favoured nation apply unconditionally to the treatment of commercial travellers and their samples. The Chambers of Commerce, as well as other trade associations and other recognised commercial associations in the contracting States as may be authorised in this behalf shall be mutually accepted as competent authorities for issuing any certificates that may be required for commercial travellers.

"Articles imported by commercial travellers as samples shall, in each country, be temporarily admitted free of duty on compliance with the Customs regulations and formalities established to assure their re-exportation or the payment of the prescribed Customs duties if not re-exported within the period allowed by law. But the foregoing privilege shall not extend to articles which, owing to their quantity or value, cannot be considered as samples, or which, owing to their nature, could not be identified upon re-exportation.

"In order to facilitate the clearance of samples of goods brought by commercial travellers of one of the two States into the territories of the other to be used as samples or patterns for the purpose of obtaining orders and not for sale, the marks, stamps, or seals affixed by the Customs authorities of one country to commercial samples at the time of exportation, and the list of such samples drawn up in proper form and certified by the competent authority, such list containing an exact description of the samples, shall form sufficient evidence, so far as the respective Customs authorities are concerned, of their nature, and shall entitle them to exemption from all Customs examination except in so far as may be necessary to establish that the samples produced are identical with those enumerated in the list. The Customs authorities of either country are, however, at liberty to affix a supple-

mentary mark to such samples, should this precaution in particular cases be considered necessary."

Under Article 23, the Treaty is to be binding for ten years.

NEW ZEALAND.—The following Customs decisions have recently been announced:—

Electric cables, in sets, with terminals attached, specially suited for use in connection with electric ignition of motor vehicle engines, are dutiable under No. 169A of the Tariff at the rate of 10 per cent. *ad valorem* on goods manufactured in any part of the British Empire, and 20 per cent. on foreign goods.

Wooden poles for carrying electric wires, shaped by hewing only, when imported without metal attachments are free of duty; when imported with metal attachments permanently fixed, they are dutiable under No. 176 of the Tariff at the rate of 20 per cent. *ad valorem* on British goods and 30 per cent. *ad valorem* on foreign goods.

[NOTE.—A "primage duty" of 1 per cent. *ad valorem* is levied on the above goods in accordance with the Finance Act, 1915. This duty is payable on importation, and is levied irrespective of whether the goods are otherwise liable to duty or not.]

NEW PATENTS APPLIED FOR, 1916.

(NOT YET PUBLISHED).

Published expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

12,125. "Annealing, reheating, &c., furnaces." BRITISH INSULATED AND HELSBY CABLES, LTD., & W. A. SPEARE. August 28th.

12,130. "Internal-combustion engines." W. H. TATE. August 28th.

12,140. "Device for heating water electrically." D. M. BROOKS. August 28th.

12,141. "Vaporisers for heavy liquid fuels for internal-combustion engines." T. W. BAKER. August 28th.

12,147. "Electric furnaces." BRITISH THOMSON-HOUSTON Co. (General Electric Co., U.S.A.). August 28th.

12,148. "Electrical switches." M. BROOKS, J. E. FRANKS, A. E. READ AND WALSALL HARDWARE MANUFACTURING Co. August 28th.

12,157. "Variable capacity for liquid-wave transmission systems." G. CONSTANTINESCO. August 28th.

12,158. "Railway signalling apparatus." C. CHEVALLIER. August 28th.

12,160. "Vapour electric converters." BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING Co. August 28th. (U.S.A., August 28th, 1915.)

12,162. "Automatic and semi-automatic telephone systems." O. GRAHN AND RELAY AUTOMATIC TELEPHONE Co. August 28th.

12,168. "Insulation of electric cables." H. TIETGEN. August 28th.

12,169. "Electric lamps." H. J. T. COOK. August 28th.

12,170. "Rheostats for starting electric motors." C. KOSNICK. August 28th.

12,210. "Electric furnaces." BRITISH THOMSON-HOUSTON Co. (General Electric Co., U.S.A.). August 29th.

12,231. "Induction electric motors." G. PESTARINI. August 29th.

12,237. "Apparatus for controlling electric circuit of flash signs, &c." A. MILLER & E. ROSCOE. August 29th.

12,238. "Aeroplanes, airships, &c." W. E. COCKS. August 29th.

12,248. "Carburettors for internal-combustion engines." G. E. BRADSHAW. August 30th.

12,250. "Combined starting device and auxiliary air valve for internal-combustion engines." E. RUSSELL. August 30th.

12,279. "Electric furnaces." BRITISH THOMSON-HOUSTON Co. (General Electric Co., U.S.A.). August 30th.

12,290. "Field service exchange." R. RANDALL. August 30th.

12,298. "Sparking plugs for internal-combustion engines." R. G. BOOTH. August 30th.

12,299. "Ignition terminals for aeroplane engines, &c." R. G. BOOTH. August 30th.

12,305. "Apparatus for converting or transforming electric currents." K. T. WANG. August 30th.

12,314. "Carburetting and feeding apparatus for internal-combustion engines." W. P. KELLY & D. C. SLATTERY. August 31st.

12,316. "Trolley poles for electric cars, &c." T. WARSOP. August 31st.

12,328. "Carburettors." W. H. SMITH. August 31st.

12,350. "Systems of electric motor control." BRITISH THOMSON-HOUSTON Co., AND H. F. FARMER & H. C. HASTINGS. August 31st.

12,351. "Regenerative braking systems." T. H. THOMAS & W. V. TURNER. August 31st. (U.S.A., February 5th.)

12,352. "Automatic train-control systems." W. V. TURNER. August 31st. (U.S.A., April 1st.)

12,370. "Internal-combustion engines." J. V. RAMSDEN. August 31st.

12,372. "Electrical warming apparatus." J. BEIN. September 1st.

12,382. "Magnetic chucks." H. HUMPHREYS. September 1st.

12,384. "Valve-operating mechanism for internal-combustion engines." L. COATALEN & SUNBEAM MOTOR CAR Co. September 1st.

12,394. "Internal-combustion engines for aircraft, &c." W. H. PEIRCE. September 1st.

12,395. "Means for operating apparatus at receiving station from sending station by electric pulsations." A. U. SARNMARK. September 1st. (Sweden, September 7th, 1915.)

12,396. "Electric furnace." I. RENNERFELT. September 1st. (Sweden, September 8th, 1915.)

12,399. "Telephone systems." AUTOMATIC TELEPHONE MANUFACTURING Co. AND A. J. RAY. September 1st.

12,400. "Signalling apparatus for mines, &c." E. T. D. HOLMES, H. S. HOLMES, & W. HOLMES. September 1st.

12,406. "Safety controlling gear for electrically-propelled vehicles." F. GAFFETT & H. K. PRATT. September 1st.

12,410. "Means for control electrically of signal indicators of mine hauling engines, winding engines, &c." J. P. FORSTER. September 1st.

12,420. "Arrangement of regulator and circuit interrupter fixed upon electric generators having a variable speed." SOC. ANON. POUR L'EQUIPEMENT ELECTRIQUE DES VEHICULES. September 1st. (France, No. 29/1915.)

12,436. "Internal combustion engines." F. SMAL. September 2nd.

12,441. "Measuring instruments." BRITISH THOMSON-HOUSTON Co. (General Electric Co., U.S.A.). September 2nd.

12,446. "Method of cooling commutators." J. G. P. THOMAS & THOMAS TRANSMISSION, LTD. September 2nd.

12,454. "Regulating apparatus for alternating-current distribution systems." U. BALLANTI. September 2nd.

12,456. "Electrical signalling systems." F. G. BELL, W. C. DAVEY AND STERLING TELEPHONE & ELECTRIC Co. September 2nd.

12,460. "Carburettors." A. E. BERRIMAN & DAIMLER Co. September 2nd.

12,461. "Protection of electrical apparatus, &c." W. HAYHURST. September 2nd.

PUBLISHED SPECIFICATIONS.

1914.

7,336. ELECTRO-MAGNETIC MEANS FOR VIBRATING PIANO STRINGS AND THE LIKE. A. H. Maitre & V. H. G. Martin. March 23rd.

1915.

11,600. TELEPHONE SYSTEMS. Relay Automatic Telephone Co., F. M. Ward, G. H. Bryant & T. M. Inman. August 11th. (Cognate application, 1,869/16.)

11,655. TELEPHONE SYSTEMS. Automatic Telephone Co. & W. Aitken. August 12th.

11,678. INTERNAL-COMBUSTION ENGINES. A. R. Brougham. August 12th.

11,690. ELECTRIC REGULATOR OR GOVERNOR. B. O. Holm Hansen. August 12th.

11,935. DYNAMO-ELECTRIC MACHINES. A. H. Neuland. August 18th.

11,974. DRIVING AND CONTROLLING DYNAMO-ELECTRIC GENERATORS. W. E. W. Rhodes & J. Firth. August 19th. (Cognate application, 13,469/15.)

11,981. ELECTRICAL FLASHER. W. Reed-Lethbridge. August 19th.

12,314. ELECTRICAL INSTRUMENTS OF THE MOVING COIL TYPE. S. F. Palmer, J. Denham & Ferranti, Ltd. August 26th.

12,361. SYSTEMS OF ELECTRIC SHIP PROPULSION. British Thomson-Houston Co. (General Electric Co., U.S.A.). August 27th.

12,868. ELECTRIC MOTOR CONTROL SYSTEMS. British Thomson-Houston Co. (General Electric Co., U.S.A.). September 8th.

13,556. STARTING GEAR FOR INTERNAL-COMBUSTION ENGINES. H. J. Craymer and H. P. Simpson. September 23rd. (Cognate applications, 16,169/15 and 338/16.)

13,717. INTERNAL-COMBUSTION ENGINES. F. W. Golby. September 27th. (Frankling R. Wright, U.S.A.)

13,768. LUBRICATORS FOR INTERNAL-COMBUSTION ENGINES. D. McGregor. September 28th.

13,815. IGNITION APPARATUS FOR INTERNAL-COMBUSTION ENGINES. H. R. Van Deventer. September 28th. (October 1st, 1914.)

14,311. SYSTEM FOR THE GENERATION OF ELECTRIC CURRENTS. C. F. Benitez. October 9th. (Addition to 17,811/14.)

14,436. COUPLING FOR MECHANICALLY AND ELECTRICALLY CONNECTING WIRES, METAL CORDS, AND THE LIKE. O. Bajma-Riva. October 12th.

15,107. STARTING APPARATUS FOR INTERNAL-COMBUSTION ENGINES. Sir K. I. Crossley, W. M. Huskisson & L. F. Barley. October 26th.

15,695. METHODS OF MAKING VITREOUS BODIES. British Thomson-Houston Co. (General Electric Co., U.S.A.). November 6th.

16,695. ELECTRIC ARC LAMPS. A. H. Railing & A. E. Angold. November 26th.

17,901. EARTH CURRENT DETECTORS AND CUT-OUTS FOR ELECTRICAL CIRCUITS. J. John & W. J. John. December 22nd.

1916.

826. PROPELLING APPARATUS FOR VEHICLES. Electric Boat Co. March 30th, 1915. (100,221.)

1,374. MEANS FOR CONTROLLING AND REGULATING ELECTRIC MOTORS. Igranic Electric Co. (Cutler-Hammer Manufacturing Co., U.S.A.). (101,103.)

1,483. ELECTRO-MAGNETIC RELEASE OR CUT-OUT. A. Fantini. January 31st, 1916. (101,104.)

2,934. COMBINED VAPORISING AND INDUCTION PIPE FOR USING MIXED OR HEAVY FUELS IN CONNECTION WITH INTERNAL-COMBUSTION ENGINES. A. Gray, J. Gaskell & W. T. Wilkes. (Cognate application, 5,392/16.) (101,111.)

3,808. INTERNAL-COMBUSTION ENGINES. E. T. W. Addyman. March 14th, 1916. (101,115.)

6,541. ELECTRO-MAGNETIC RELAYS. Siemens & Halske Akt. Ges. June 22nd, 1915. (100,732.)

6,648. MEANS FOR SUPPLYING COMBUSTIBLE CHARGES TO INTERNAL-COMBUSTION ENGINES. G. C. C. Henderson. May 9th, 1916. (Addition to 21,620/14.) (101,132.)

6,696. MEANS FOR DISCHARGING STATIC ELECTRICITY FROM A MOVING PICTURE FILM OR THE LIKE. C. Van Deventer. May 17th, 1915. (100,487.)

Cuba.—The U.S. Consul, writing on the trade future in Cienfuegos, concludes thus:—"One result is certain in connection with the extension and maintenance of trade now secured—success to any marked degree will never be attained through correspondence solely, excepting in the mail-order business in the relatively smaller articles. In the extension of trade the direct contact of representatives and prospective purchasers will accomplish greater and more satisfactory results than by long-distance negotiations and catalogues. And by representatives is meant men who not only know the business they represent, but the language of the country as well. . . . Looking still farther ahead, Cuba need be but a stopping-off place, but one point of an extended route covering Central and South America. To hold trade once secured the eradication of one evil at least is absolutely necessary, that of substitution. In Europe, should a house not have the exact article desired, it is secured from other sources and, if need be, regardless of cost, in order that the customer may be accommodated and his trade retained. Extension and retention of trade will be governed entirely by merit and business accommodation. Merit will not terminate in the article itself, but includes as well the way in which it is presented for sale and packed for shipment, details in which European countries excel."